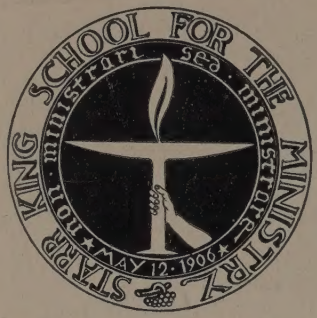

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The Fathers of Evolution

and Other Addresses

by

John H. Dietrich

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FOREWORD

The addresses composing this volume are published as a result of the demand by those who heard them. They are printed as delivered before the First Unitarian Society of Minneapolis. Their style therefore is that of spoken and not written discourse, and does not so easily lend itself to print. Any attempt to change it, however, would have involved a difficult, if not impossible task. Neither would it have been desirable. The chief effectiveness of a public address after all is the manner of presentment, and while it is impossible to impart this to the printed page, it can be done more nearly by preserving than by changing the original utterances.

The biographical addresses were delivered in a series on alternate Sunday mornings during the Autumn of 1926, while the others were delivered at different times during the past few years and are included because of their related subjects. This accounts for occasional repetitions which of course would not occur in chapters written for a book. And of course since these addresses deal with the lives of men and the principles of a scientific theory, they lay no claim to

originality. They are merely attempts at presenting in simple phrase and brief form the outstanding events of these lives and the significant features of this theory as found in more comprehensive treatises.

It only remains to be said that the purpose in publishing them is precisely the same as in delivering them—to bring to people, in these days of dreadful reaction against scientific knowledge and intelligent research, a better understanding of the doctrine of evolution and its importance for the future of the world and of mankind.

January 14, 1927.

John H. Dietrich

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TO

the Members and Friends of the First Unitarian Society of Minneapolis, who for ten years have sustained me on a free platform, and who have demanded the publication of these addresses.

THE FATHERS OF EVOLUTION

I.

FOREFATHERS OF EVOLUTION

The nineteenth century has frequently been referred to as "The Wonderful Century" because so much was accomplished during this period in the way of invention and discovery as well as of advance in science and the arts. And when the history of this century comes to be written I imagine that its most significant feature will be an account of that movement by which evolution became the dominant factor in scientific circles, while its influence came to be felt in every sphere of human thought and endeavor. At the beginning of the century, the few who ventured to entertain evolutionary ideas were regarded by their scientific contemporaries as wild visionaries and by the world at large as harmless fanatics; but at the end of the century, evolution had not only become the guiding principle of all naturalists, but had profoundly affected every branch of physical science, as well as influenced the thought of many historians, sociologists, economists, philologists, and even theologians.

How did this revolution of thought—perhaps the greatest that has ever occurred—come about?

What kind of men were responsible for this change of front? What were the influences which led them to adopt such radically different views? And how were they able to convince the world at large of their strange doctrine? These are the questions with which I propose to deal in this series on the "Fathers of Evolution." There is no group of men in all history for which I have a greater admiration than the leaders in this important movement—Darwin and Wallace, Spencer and Fiske, Huxley and Haeckel; and would that I could portray for you a vivid picture of the noble characteristics of these men to whom mankind is so indebted! For one is impressed not only by their intellectual greatness but also by their moral grandeur. No group of men ever worked together in greater harmony or with more mutual consideration and affection than this noble band of pioneers in a great cause. It is unfortunately true that scientists, like others, have at times forgotten their high vocation and allowed self-interest to obscure the interests of truth; but not a single incident in the lives of these men marred the unity of purpose with which they strove toward a great ideal. In modesty and simplicity and with unexampled generosity toward each other they worked together for half a century. So noble indeed was the great central figure—Charles Darwin—that all those who were associated with him were bound to him by the strongest ties of admiration and affection; while he, in his delicate modesty, thought more of them than of himself, more

of the results of their work than of his own great achievement.

And the mention of the name of Darwin suggests the thought which I would discuss this morning under the title, "The Forefathers of Evolution." It seems to be the popular opinion that Darwin discovered and proclaimed the doctrine of evolution, that before the publication of his "Origin of Species," no one had ever heard of the theory; whereas the ideas of evolution were a part of human speculation as far back as we have any records of human thought. Perhaps the whole problem of evolution and its relation to Darwin was summed up in a conversation which Prof. Judd had with Matthew Arnold in 1871. Arnold laughingly remarked, "I cannot understand why you scientific people make such a fuss about Darwin. Why, it's all in Lucretius who wrote two thousand years ago." And Mr. Judd replied, "Yes, Lucretius guessed what Darwin proved." The idea of evolution was itself an evolution, and if you will study the history of human thought from the beginning, you will find ancient pedigrees for all that we are apt to think modern; and this is especially true of evolution. When we study the contents of Greek, mediæval, and sixteenth to nineteenth century speculation and observation, it becomes clear that they form a continuous whole, that the influence of early upon later thought is greater than most people imagine, and that Darwin owes even more to the Greeks than we have ever recognized. It is true that until 1858, speculation far outran fact, and

that the development of the idea was at times arrested and even turned back; but the evolution doctrine was not reached by any sudden leap. It came through the progressive development of every subordinate idea connected with it, until it was recognized as a whole by Lamarck, and proved by Darwin.

The thing above all else that Darwin did was to discover the facts which established as a natural law what previously had been only a hypothesis, and this will always mark the difference between the "before and after Darwin" conditions in biology—before Darwin, theory; after Darwin, fact. There are nearly always three stages in connection with the discovery of a law of nature: first, that of dim suggestion and pure speculation, with no regard for facts; second, that of clear statement as a tentative or working hypothesis in explanation of certain facts; and finally, the proof or demonstration of that theory by facts. Darwin provided the proof, benefiting greatly by the hard struggles of his predecessors through the first two stages. We find in his immediate predecessors men like Buffon, Erasmus Darwin, and Goethe who were confirmed believers in the theory of development. Searching for their inspiration, we are led back to the natural philosophers beginning with Bacon and ending with Herder. Among these men we find merely the second birth or renaissance of the idea, and among the Greeks its first birth. Thus we see that ideas of evolution, both in the organic and the inorganic world, existed but remained barren for thousands of

years. Yet by the labors of a band of workers in the last century, these ideas, which were but the dreams of poets and the guesses of philosophers, came to be the accepted creed of working scientists, while they profoundly affected thought and language in every branch of human enterprise. It is this group of men that we are to study in this series of addresses, and this morning I want to give you a birds-eye view of the speculation in this respect which preceded the establishment of the theory as a scientific fact.

As you can readily see, there are just two possible explanations for the existence of things, and these have led to two very distinct and opposite lines of speculation—one suggested by the vocations of people, and the other by the nature of their surroundings. These two lines of thought may be expressed by the terms "manufacture" or "creation" and "development" or "evolution" — the gradual unfolding of simpler forms to more complex forms. Now, according to the former theory of creation, the whole universe and all that is contained therein was suddenly made out of nothing by the direct command of God at a certain moment of time. According to this, every different species of mineral and vegetable and animal was then created in the exact form in which it exists today. The determining factor in this theory was a contemplation of the vocations of primitive peoples. As men looked about them, they saw that most of the things were made by men, and a very plausible hypothesis was that the world and all there is in it was similarly made

by the direct will or effort of God. The other theory, known as the theory of growth or evolution, was based on the fact that men had always seen about them the processes of growth; and they deduced from this that just as trees grow, animals grow, and men grow from infancy to manhood, so did this world grow into its present form from some earlier and simpler form. And this thought was substantiated by the observation of the similarity of structure among the different animals as well as by the notice of the constant change through modification that was taking place everywhere.

The beauty of this general idea of development or evolution has been sung by the poets from Empedocles and Lucretius down to Goethe and Tennyson; and the principle of development or evolution, as harmonizing with the highest conceptions of science, have been recognized by the philosophers from Aristotle and Strabo down to Kant and Spencer. Yet it was not until the nineteenth century that any serious attempts were made to establish the hypothesis of evolution as a definite theory, based on sound reasoning from careful observation; and it was not until the days of Darwin and Spencer that the general principle was applied and worked out in detail to every form of existence. And it is just a birds-eye view of how the first crude notions of evolution were developed by successive thinkers into more just and noble conceptions that I would give you this morning. What I shall say will necessarily be very brief and disconnected, but those who are

really interested in the matter can turn to several admirable books on the subject such as "From the Greeks to Darwin," by Professor Osborn, "Pioneers of Evolution," by Edward Clodd, and "Darwin's Predecessors," by J. Arthur Thompson.

I

It is one of the most interesting things in the history of thought to find that the idea of the evolution of the world and the living things in it was held by a great many people more than two thousand years ago. Almost as soon as that most brilliant of the ancient nations — the Greeks — began to speculate on the past history and the present nature of the world, they felt that this was the answer to the riddle of existence. From the contemplation of the phenomena about them, the ancient sages were gradually led to entertain the idea that all the features of the earth had been produced through the slow and constant action of the causes seen in operation on every hand. The idea was incorporated in a myth, which was suggested by the slow and gradual transformation of an egg into a perfect growing organism. The birth of the world was pictured as an act of incubation, and male and female deities were invented to play the part of parents to the infant world. And these early myths were taken over and given more rational form by the philosophers. One of the earliest of these thinkers, Thales, who lived about 600 B. C., declared that all the varied things in the world had grown

in the course of ages out of some vague universal fluid. His two principles were: first, that nothing comes into being out of nothing; and second, that everything is always becoming something else; in other words, he thought that water was the primitive element, and all other things developed out of it. One of his pupils, Anaximander, taught that all living things had come out of non-living slime, and passed through many forms before they reached their present shapes. He even made the perfectly sound point that there was a time when man was a fish. He was the first to assert that life sprang from non-living matter, and the first to suggest what modern biology has proved concerning the marine ancestry of the higher forms of animal life. He also intimated that there was some connection between the prolonged period of infancy in man and the social instincts and affections, a theory which Fiske later established as an important factor in social evolution. A third member of this same school was Heraclitus, who taught about the same, except he held that the primitive element was fire.

As time went on, this vague notion that living things were not always as they are now, but had somehow grown out of simpler elements, struggled nearer and nearer to the truth, and became more and more applied to details; that is, theories of the beginnings of life were followed by theories of the origin of its different forms. In all the fragments of speculation that have come down to us, it is of course twisted into forms that de-

part widely from the truth and that are mixed up with speculations that seem to us grotesque. Nothing else could be expected in that first dawn of knowledge. The remarkable thing is that so many correct guesses—for they were little more than guesses, in the absence of systematic observation and experiment — are found among the false ones. I will call attention to only the more interesting points that were added to the original idea by the speculations which followed.

Empedocles, born about 490 B. C., thought out something like the doctrine of the struggle for life and the survival of the fittest, which seems so peculiarly modern. He said that innumerable forms were developed in the crystallization of the primitive elements, and of these, many perished because they were unfitted to live. A little later, Leucippus put forth the theory that the universe is built up of tiny particles, which he called "atoms" because he regarded them as the ultimate and indivisible elements. He said that an infinite number of atoms, of different sorts and sizes, tossing about during infinite time in an infinite space, might produce the things that actually exist among the myriads of chance forms they would assume. This eternal tossing at hazard is quite opposed to our knowledge of law in the universe, and we now know that atoms are not indivisible; but the atomic theory has played a great part in science and continues to play it, with a modification in regard to the constitution of the atom. Democritus, a few years later, gave a finer and more reasonable shape to the

idea of the atomic evolution of the universe; and a century later, Epicurus gathered together the speculations of the leaders of the Ionic school, to which these belonged, and gave them more definite shape; and his general conclusions were the accepted theory of the later and better known philosophers, such as Plato and Aristotle.

But the best and most finished account of the theory is found in the work of the Latin poet, Lucretius, "De Rerum Natura," "On the Nature of Things." I wonder how many of you have read this remarkable poem with its thoroughgoing rationalism and humanism, as you will note from the closing lines. He speaks of how foolishly we lay to the charge of the gods that which is our own fault.

> "So, loathe to suffer mute,
> We, peopling the void air,
> Make gods to whom to impute
> The ills we ought to bear;
> With God and Fate to rail at, suffering easily."

I am tempted to quote at length, but I must confine myself to the content. You may wonder how this beautiful form of Greek speculation should be found in a Roman poet. Just as the curtain was falling on the brilliant episode of Greek civilization, their culture was transferred to Rome, in the century before the birth of Christ. The Romans were great administrators and lawyers, so we are not surprised that in their hands, science and philosophy developed no further; but it is in the poetry of Lucretius, a disciple of Epicurus, that we find the idea of evolution in the highest form it attained in the Greek mind. At

the outset, he discusses various theories of origins and dismisses them; and then he takes up the atomic theory, except that he has the atoms ruled by unvarying law instead of tossing aimlessly in the void. He excludes design entirely and teaches that by natural law these atoms group according to their affinity and thus carry on the birth, growth, and decay of things; the variety of which is due to the different forms of the atoms and to differences in their combination. "The earth, the sun, the heavens, and the race of living things" are slowly formed out of their orderly combinations. First plants and then animals rose out of the earth—the mother of all things — under the influence of rain and heat. Many of the living forms that arose were unfitted for life on earth and so perished. Men were evolved from non-human animals. They were at first savages, without speech or social order; and in the development of civilization, they passed from an age of stone weapons to the use of metals, first copper, and then iron. Is it any wonder that Matthew Arnold said, "It is all in Lucretius."

II

Then came Christianity and speculations of this kind fell into contempt in Europe, and the night of the Dark Ages settled on the ruins of the older civilization. And with Christianity came the Hebraic cosmogony, built upon the idea of manufacture or creation, as you find it in the Old Testament. This was taught as a part of the

Christian system of theology, and as this religion laid more and more stress upon faith as the basis of salvation, the mere suggestion of any theory that might contradict Christian dogma became more and more dangerous; and so for the next fifteen hundred years, only here and there do we catch a glimpse of the truths that Greece had discovered. In the course of the Middle Ages, we find more than one strong thinker, like Scotus in the ninth century or Bruno, put to death in 1600, attempting to bring speculation back to Greek lines; but it was not until after the full revival of ancient learning that it returned in appreciable manner. In the meantime, Greek learning had passed over to the Arabs, and their scholars began to develop the more scientific methods of Aristotle, who had fully recognized the value of minute observation. From Arab Spain the new spirit crossed the Pyrenees, and soon such men as Roger Bacon and Albert the Great were laying the foundations of experimental science in the heart of Christendom. When the Renaissance and Reformation occurred in succession, the barriers to freedom of speculation were gradually broken down. In the new and stimulating atmosphere, men began again to look out on nature with keen inquiring eyes. The narrow limits of the little mediæval universe were thrust back indefinitely. The crystal globes that were thought to have hemmed it in were shattered by Copernicus and Galileo, and the stars sank back into profound abysses of space. Before the end of the eighteenth century, the idea of evolution was

again peeping timidly out of the pages of scientific writings.

But strange to say, after the awakening of natural science in the sixteenth century, the development idea began to crop out not so much in the scientists as in the philosophers — Bacon, Decartes, Leibnitz, Hume, Kant, Lessing and Herder. These men were more and more convinced of the continuity of life and were groping in the dark for a working theory of evolution, which we find constantly expressed in their works, but none of them seemed able to formulate a theory that would explain the facts. The first naturalist to give a broad and concrete expression to the evolutionist doctrine was the Frenchman, Buffon, who very clearly held it; but his position among the pioneers is weakened by the fact that like Galileo, he recanted under the iron grip of the church. In England, Erasmus Darwin, born in 1731, boldly advocated development and anticipated more than one idea of his more celebrated grandson. He noted the unity of plan in all animals, the metamorphoses of animals like the frog and the butterfly, and the changes wrought in animals by artificial selection and climatic variations. These things he said pointed to a common descent of all living things from some living filament. And then came Lamarck who by some is claimed to be the real founder of evolution.

But before speaking of Lamarck, we should notice that in the field of astronomy and geology, the principle of evolution was being slowly established about this same time. In 1755, the

greatest of German philosophers, Immanuel Kant, then a young man of more scientific than philosophic temper, had published the germ of the nebular theory—or the condensation of the heavenly bodies out of a thin and far-scattered mist of gaseous matter. His little work attracted no attention, and was in fact completely forgotten for nearly a hundred years. In the meantime, the brilliant French astronomer, Laplace, impressed the theory on the cultivated mind of Europe by his full and powerful elaboration of it, in his "Exposition of the System of the World," which he issued in 1796. Since that time the principle of evolution has had a firm base. His theory has naturally had to undergo a good deal of modification; but his name is forever associated with the first great demonstration of the truth of evolution. And just a little in the rear of the astronomers came the geologists. In 1829, Sir Charles Lyell published his "Principles of Geology," which gave a new extension to the idea of evolution. Laplace had shown that our earth was originally a huge fragment of attenuated matter thrown off by the condensing nebula. Lyell carried the story a step farther and showed that the agencies which we see at work on the face of the earth today have slowly formed the belt of solid rock that confines its molten interior. In addition, he extended the period in which this development took place to give sufficient time for the evolution of the forms of life.

You see the way was being rapidly cleared for Charles Darwin and Herbert Spencer. The

application of evolution to living things was made difficult, not only by the general prejudice arising from traditional views and the determined opposition of the Christian Church, but by the fact that the great naturalists —Linnæus and Cuvier —had declared the various species of animals and plants to be unchangeable. When, therefore, Jean Lamarck, the French naturalist, began in 1802 to press the idea of biological development, he had tremendous prejudice and opposition to fight. His most famous work—the Zoological Philosophy — elaborated a complete system of evolution through the now familiar forces of heredity and adaptation. Of course, he had not yet thought of the reasons for adaptation, as did Darwin a little later when he formulated his law of natural selection. Lamarck's speculations in detail were naturally crude and premature, but his general work was so well thought out that even one of the modern schools of evolutionists goes by the name of the Neo-Lamarckians. In his day the opposition was too strong for him, and he died in obscurity; but the principle had now considerable momentum, and was breaking out on all sides. Goethe — the greatest scholar of his day and perhaps of all time — developed and applied it in his immortal works.

During this time — the first half of the nineteenth century—it was making its appearance occasionally in England. A number of writers published statements in favor of evolutionary views; and in several cases the theory of natural selection was more or less distinctly suggested; but

most of these were little heard of. But there was one work which attracted much popular attention and spread the theory throughout Great Britain. In 1844 an anonymous work (since known to have been written by Robert Chambers) called "The Vestiges of Creation," was published. This book was a very bold pronouncement of evolutionary views. Beginning with a statement on the nebular hypothesis of Kant and Laplace, it discussed the problems of the origin of life, when life became possible on a cooling planet; it argued strongly in favor of the view that all plants and animals, as the conditions under which they lived changed, had given rise to new forms, better adapted to their environment; and insisted that all living forms had been gradually developed from the simplest types. This work had little exact knowledge and much crude speculation; but its author sought to reconcile the new doctrine with religious teaching, and thus stirred up controversy from one end of the kingdom to the other, until his work ran through twelve editions.

In 1852, Herbert Spencer began his life work on evolution in an article in "The Leader" on "The Development Hypothesis." This was a complete treatise of the whole theory of evolution, without specifying what were the causes of modification which eventually developed into new species. He constantly spoke of a "modifying influence," but never attempted to describe it; and this article shows how, by the middle of the last century, science was trembling on the verge of

the discovery of that "modifying influence." And at this very time Charles Darwin and Alfred Russel Wallace were bringing a wide and exact biological knowledge to bear on the subject; and Darwin had already grasped the principle of natural selection, which he later announced as the "modifying principle." As early as 1842, he made a manuscript sketch of his theory, and from that time until 1858, he was engaged in building up its structure. In this same year, he was startled to receive from Alfred Russell Wallace a manuscript containing exactly the same theory, although neither had ever suggested his idea to the other. A joint paper was read in their names before the Linnaean society and the famous "Origin of Species" appeared in 1859. And this book made clear how all that had preceded it not only contributed thereto, but gained a significance and value which would never have amounted to anything had it not been for Darwin. When the relation of the several parts to the whole became manifest, each fell into its place like the pieces of a child's puzzle map.

III

I shall not speak of the contents of this book nor of the fiery controversy that followed its publication. These things belong to future addresses. But having followed the growth of the idea thus far, I might as well complete it with a few sentences. The "Origin of Species," as you know, dealt only with vegetable and animal life. In

1863, Huxley boldly applied the principle of evolution to man in his "Man's Place in Nature," and Darwin followed with his "Descent of Man," in 1871. Then Herbert Spencer's successive articles and volumes extended it over the whole contents of the universe. During this time Haeckel was spreading the new gospel in Germany with characteristic vigor, and John Fiske, by his numerous lectures and books, brought it home to the people of America. And so the idea of evolution was fully evolved, and by the end of the nineteenth century, group after group of scholars had made it the vital principle of their research. Archaeologists were slowly bringing to light the evolutionary story of prehistoric man; philologists linked the languages of the world in genealogical groups; religions, arts, social institutions had the same broad light cast on them; and today the idea of evolution is one of the surest guiding principles of the scientific investigator. There have been modifications of the earlier theories, but the general principle has been applied to every field of thought, and no scientist of repute today denies it.

Only a few years ago, Prof. Kellogg, one of the ablest living biologists, said "Evolution is regarded to be as proved a fact of biology as gravitation is in the science of physics;" while Prof. Davenport, another prominent biologist, declared, "I do not know a modern scientific man who does not believe in evolution," and President Morgan writes, "A treatment of biology or geology which does not accept evolution is today as impossible

as a course in geography which denies the earth to be round." Evolution is an established historic fact in the realm of science; no scientist of any repute anywhere doubts or disputes its reality; and yet the churches are seeking to force out its evolutionists as heretics; state legislatures are forbidding the teaching of evolution in tax supported schools and colleges; and the general public is in sad confusion and is fast coming to utterly repudiate the doctrine. How do you account for a situation like this?

In the first place, I account for it by the fact which I treated in full two weeks ago — by the tremendous gap which exists between our laboratories and the sources from which people gain their information, and by how little the mass of people know about the great stores of knowledge that exist in our academic halls. In fact, evolution has been so well established in the minds of scientists and scholars generally, that they took it for granted and imagined that every one else did the same. I remember when I came here ten years ago one of our trustees, having read a previously published address of mine on evolution, told me that he thought it was a splendid address and in its time probably all right, but there is no longer occasion for a discussion of this nature; the evolution controversy is a thing of the past; everybody accepts evolution. That is the answer to the question just proposed. The scientists and the scholars accepted evolution, made it the foundation for all the structures of thought they erected, forgetting all the while that the multitudes of

common people never heard of their structures of thought nor of the foundation on which they were built. Instead they were slowly but surely being inoculated with the doctrines of the Christian church, which had been the traditional and habitual basis of human thinking for fifteen hundred years, and which utterly repudiated the doctrine of evolution.

And this suggests the second reason for the present controversy—and that is the attitude of the Christian church. The church now, as always, is absolutely faithless to the truth and even to the advancement of human life in the interests of its own dogmas. Today, as always, the church stands ready to take advantage of the ignorance of the people, for the maintenance of its peculiar doctrines. And even the few men within its ranks who know better are either indifferent or afraid. And while these Modernists hold their peace and tremble in their shoes, the Fundamentalists, who see with perfect clearness that the whole structure of Christian theology is doomed by evolution, have entered upon a campaign for its destruction, simply because they are in no wise interested in the truth, but only in the preservation of their own false and immoral theology. So we need, above all else today, to carry to the multitudes in clear and convincing fashion the knowledge which has been discovered about the universe and ourselves, and which is utterly useless until it has become the common possession of men and women everywhere.

II.

CHARLES DARWIN

In this series on the "Fathers of Evolution," we are discussing those men who brought about that tremendous revolution in human thinking during the last century by the establishment of the doctrine of evolution; and today we treat the central figure in this noble band of pioneers — Charles Darwin, whose labors more than anything else, were responsible for this change of front in the whole intellectual world. It is scarcely possible for us to estimate the importance of this man's work, for it is a simple fact that the whole field of human thought and endeavor has been entirely transformed by his genius. We look out upon a different universe, we seek different individual and social ideals, we live different lives because Charles Darwin wrote and gave to the world his "Origin of Species." And it was this fact that led John Fiske to say: "When the extent of his work is properly estimated, it is not too much to say that among all the great leaders of human thought that have ever lived, there are not half a dozen who have achieved as much as he," and

another distinguished scholar to assert that "Charles Darwin holds a position in the history of knowledge which is almost isolated in its dignity and eminence." And even though this were not true, even though he had not changed the whole trend of the world's thought, in fact although his achievements had been practically insignificant, still his life would be a fitting subject for a Sunday morning address, because it was one of such simple beauty and his character one of such true sublimity that we might well pause to glorify what he was rather than what he did, and consider him one of the moral giants of the ages, for as Huxley, his bosom friend, said: "His intellect had no superior, but his character was even nobler than his intellect."

In treating his life, I shall follow my usual custom of first sketching his biography, then discuss his work and his character, and finally treat the contribution which he made to the world. In this case the biographical facts can be quickly told since his career was unusually quiet and uneventful. It was that of the student and the scientist who spent his days in the seclusion of his laboratory, and contains none of the glamor found in the life of most great men. For fifty years he did practically nothing but observe and dissect and examine botanical and zoological specimens, while his recreation was found in occasional wanderings over the countryside with his dogs and children. This quiet life was interspersed only by an occasional trip to London, the occasional visit of a friend, and the occasional publication of a book;

and yet today there is scarcely a better known man in all the history of the world than this secluded figure.

I

Darwin was born on the same day as Abraham Lincoln, February 12, 1809, at Shrewsbury, England. His inheritance must have given him a scientific bent. His grandfather, Erasmus Darwin, had already propounded the theory of evolution. His father, Robert Darwin, was a physician and had an unusually keen faculty of observation. His mother was a daughter of Josiah Wedgewood, the founder of the famous pottery works; and it might be further noted that Sir Francis Galton was his cousin. So whether or not mental characteristics are inheritable, there is no doubt that the scientific atmosphere and tradition of his home would tend to direct his mind toward science. As a boy, Darwin was strong and active and especially fond of the open air. He gave no promise in these early years of an unusual career; in fact, he was slow to learn and considered dull by his teachers. First he went to the grammar school at Shrewsbury, where he was publicly rebuked by the school-master for wasting his time. In 1825 he went with his brother to Edinboro for the purpose of studying medicine, but he found the lectures "intolerably dull" and made so little of them that his father decided that he would never make a successful physician and so did what fathers frequently do with dull boys—started him on a theological career. For this purpose he went

to Cambridge; but of this period he writes, "During the three years which I spent at Cambridge my time was wasted so far as academical studies were concerned." About that time his father, despondent over and exasperated at Charles' neglect of his studies and his interest in sports, once deeply mortified the boy by exclaiming, "You care for nothing but shooting, dogs, and rat-catching, and you will be a disgrace to yourself and all your family!"

Of course, we realize now that the trouble was not with the boy but as is frequently the case, with the educational system. From the beginning, he showed many desirable and significant traits. I have gathered my information from his autobiography, where he tells us that he had "much zeal for whatever interested him and a keen pleasure in understanding any complex subject or thing." He was fascinated by geometry and chemistry. In fact, he spent much of his spare time in performing chemical experiments at home in an improvised laboratory, and he did this so much that he was nicknamed "gas" by his playmates. From earliest boyhood, he had the collecting habit. He says, "I collected all sorts of things—shells, seals, coins and minerals," and then adds that he "took much pleasure in watching the habits of birds and observing insects with much care." While at Edinboro, instead of attending the lectures, he would go off on expeditions to the seashore with the professor of zoology, collecting animals washed in by the tide; and these he dissected and analyzed with what he described as a "wretched microscope."

The truth is, as he suggests, that this boy possessed a scientific mind, and the schools and colleges of that time, almost entirely classical in their curricula, were not fitted to train such a mind; so that the failure of Darwin at school is an indictment not of the boy but of the educational system of England of that day which was unable to interest and train what turned out to be one of the greatest minds of the century. As Huxley put it, "They counted the only boy of original genius who is known to have come under their hands as no better than a dunce."

But as is frequently the case, there was a man in the faculty at Cambridge who was much greater than the educational system of which he was a part and who was thoroughly imbued with the scientific spirit, and that was Prof. Henslow, one of the most distinguished botanists of his time. He became interested in this unusual theological student, who cared more about a curious insect than all the dogmas of the Christian church; and between the two men, there grew up a warm and lasting friendship. This friendship, says Darwin, "influenced my career more than any other circumstance." In fact, it was the turning point of his life; for it was Prof. Henslow who taught him to develop rather than to restrain his interest in the objects of the natural world; who gave him his first systematic guidance in natural science; and, above all else, who secured for him the appointment of naturalist on the "Beagle," which determined the character of his whole later career and laid the foundation for the contribution he

made to the world of thought. In short, Prof. Henslow helped the young Darwin, helplessly floundering about, to find himself, and that is about as great a service as one man can do for another.

The voyage on the Beagle began in 1821, when Darwin was twenty-two years old, and extended over a period of five years. It was mainly spent along the coasts of South America. He says: "This was by far the most important event in my life, and has determined my whole career." It gave him "the first real training and education of mind," and what is more important, it gave him an opportunity to study natural history on a grand scale, bringing him in contact with all the plants and animals of every part of the world. It was a rare opportunity for a young scientist, and Darwin made the most of it. The results of this voyage were fruitful and in the end momentous. First, he wrote a general history of the trip with an account of such observations as would be likely to interest the ordinary reader, which was published under the title "A Naturalist's Voyage Round the World," a book which attained an immediate popularity and remains today a fascinating book of travel. This was followed by the publication of the detailed scientific results of the voyage, which gave their author a place among the leading scientists of the world. And finally came the "Origin of Species," which, though not published until twenty years later, must be regarded as the supreme result of

this voyage, for it was while observing the plant and animal life in various parts of the world that he became convinced that the theory of creation was false, and was started on the line of investigation which led ultimately to the writing of this immortal work.

For six years after returning from the Beagle voyage, Darwin lived and worked in London; and it was during this time in 1839 that he married his cousin, Emma Wedgewood, a union which resulted in a most devoted comradeship during the remainder of his life. But shortly after his marriage—in 1842 to be exact—he left London because of ill health, and settled in a country house at Down, where badly hampered by sickness, he spent the remainder of his life in tireless industry. "Few persons," he tells us, "could have lived a more retired life" and yet it was this absolute retirement that made his vast achievement possible. He once wrote to Huxley that he did not understand how he accomplished anything with the constant demands upon his time, and said that he (Darwin) could not possibly be a scientist and live a public life both.

As soon as he was comfortably settled in the country, he began to study the origin and development of life as the Beagle voyage had suggested it to him. What he had seen on this voyage convinced him that the only tenable hypothesis was "descent with modification," in other words, evolution. But how could this be demonstrated? For twenty years he worked on the problem with a patience and persistence that is beyond our com-

prehension. He collected facts, made observations, performed experiments beyond estimate, and slowly but surely he came nearer and nearer to a demonstration of the theory that had dawned upon his mind while on the Beagle. He worked almost entirely alone, confiding his secret to only three men, his dear friends and fellow-scientists —Joseph Hooker and Charles Lyell in England, and Asa Gray in America. All these were sceptical and Lyell was convinced that Darwin was "investigating a mare's nest"; and yet he worked on in confidence and patience, with no purpose but to find the truth, and determined to make no announcement of his theories until they were established. And finally at the end of twenty years, there occurred that dramatic and almost unbelievable incident, which constitutes one of the most unusual coincidents in the history of science. I shall treat this more fully in a succeeding address. At present, suffice it to say that just as Darwin was about to announce his theory, he received from Alfred Russell Wallace, who had been working altogether independently on the other side of the globe, a paper in which Wallace sketched the outline of a theory identical with that which Darwin had reached as a result of his many years' work. This paper, says Darwin, was so like his own in all its features that "had Wallace had my manuscript, he could not have made a better short abstract."

And now Darwin with his characteristic modesty proposed publishing Wallace's paper without any comment, and thus lose all credit for his work

of more than twenty years; but on consultation with Hooker and Lyell, it was decided to publish Wallace's sketch in connection with one by Darwin which he had written sixteen years earlier. This was done and in July, 1858, the announcement of the law of evolution was made to the Linnaean Society over the names of Darwin and Wallace, as co-discoverers. To Darwin, however, as the world has long since agreed, and Wallace himself was ever ready to recognize, belonged the chief credit. Darwin had reached his conclusion much earlier, and what is more important, had developed his theory with a wealth of argument and a profusion of illustration and detail which Wallace at that time knew nothing about.

The original announcement of the discovery having been made, Darwin at once began to prepare the detailed evidence which led him to his conclusion and which he had been collecting all these years. This task occupied thirteen months, until November 1859, when appeared that epoch making book, entitled "On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle of Life," commonly known as the "Origin of Species." With the argument presented in this great book, with the specific contribution which it made to the doctrine of evolution, with the storm of denunciation and ridicule which broke upon its author's head, with the battle which was fought in his behalf by such sturdy champions as Huxley and Tyndall, Haeckel and Fiske, with the significance of the revolution in human thought which the book

caused—with all this we are not now concerned. We are just now dealing with the biographical facts of Darwin's life.

After the appearance of the "Origin of Species" there is little to record, except that Darwin remained in his country home quiet and unperturbed, refusing to enter controversy, patiently pursuing his studies, and occasionally publishing a new book in further illustration of his theory, each a masterpiece in its particular field. The most famous of these was the "Descent of Man" in which he applied his theory of evolution to man as well as to the different species of plants and animals. Aside from the publication of these books, his career was uneventful down to the moment of his death. Year after year, he became more and more assured of the triumph of his work and of the fame which he had attained, but still he remained the modest, gentle, patient student, humbly sitting at the feet of nature, to learn more of the wonders of her life — to the end a seeker after truth, utterly oblivious of what the world might say or think. He quietly passed away in April, 1882, conscious of the contribution he had made to the world and the esteem in which he was held by mankind—both of which were manifest in the fact that his ashes were gathered up and laid in Westminster Abbey that he might repose through the ages with England's most illustrious dead. His body rests by the side of Sir Isaac Newton, who did for the heavens what Darwin did for the earth—"established order in the

place of chaos and laid the foundation for the future understanding of nature and of man."

II

As a scientist, Darwin must be regarded as the ideal type. Huxley says, "The more we knew him, the more he appeared the incorporated ideal of a man of science." His faculties of observation and analysis and classification were as great as the world has ever known; his reasoning powers were unusually brilliant; his knowledge of nature was comprehensive; his constructive imagination was unexampled, his patience inexhaustible, and his industry untiring. And above all, he had a passionate love of truth. Throughout his long life, he sat meekly at the feet of nature, asking for the truth regarding her vital processes. He sought the facts — always the facts and all the facts, and these he obediently followed, regardless of consequences to himself or others. Even though these facts contradicted all that science had been teaching in the past, even though they destroyed the consecrated wisdom of the ages, even though they led to conclusions which seemed grotesque and absurd, nevertheless they were the facts and must be accepted until disproved. And he continued in this search for truth long after he had reached his conclusions, not to substantiate them but to test and make sure of their soundness; and had this further study and experiment contradicted all that he had hitherto written, he would have been the first to acknowledge the mistake.

But as a scientist, we must notice not only his intellectual attainments, but what might be considered his professional ethics, such as his attitude toward other scientists, his reaction to abuse, and his attitude toward his own achievements. In regard to the first, his attitude toward his fellow scientists, he could not have been surpassed in unselfishness. He had an almost morbid fear of not giving others due credit for their work, and was inclined even to the point of self-effacement in his generosity. The best illustration of this was his attitude toward Wallace. Darwin was determined to publish Wallace's paper without any reference whatever to his twenty years' of labor upon the same problem, or to the fact that he had reached the conclusion years previous. He wrote to Lyell, "I would rather burn my whole book than that he or any other man should think that I had behaved in a paltry spirit." And it was only through the persuasion of his friends that he permitted his name to be coupled with Wallace's when the announcement was made. Another measure of the real man was the way in which he received ridicule and abuse. I doubt if any man ever had to endure a fiercer storm of ignorant and bitter denunciation than Darwin, following the publication of his noted book. He was condemned by scientists and theologians alike — for his "monkey science" and his "dirt philosophy"— with only an occasional friend like Huxley and Hooker to defend him. And yet through all this dreadful period, he maintained a placid sweetness and genial good nature. Referring to a book in which he was

described as an utter ignoramus, deceived by a mad delusion, he remarked, "I doubt not there's some justice in that." Speaking of a terribly vicious article in a magazine, he said, "It is uncommonly clever." And referring to one of his most unscrupulous assailants, he remarked, "I know that one man may roast another and yet have a kind and noble heart." I think these instances are sufficient to show you that he had that rare spirit of generosity and good will which sees the honest purpose behind the insulting words, and with utter confidence in the truth, proceeds undisturbed and unafraid. And this generosity was surpased only by his modesty. He never ceased to express astonishment in his letters that his "Origin of Species" should have aroused such an interest. When he finished the proofs of the "Descent of Man" he wrote Joseph Hooker that he hadn't "the remotest idea whether the book is worth publishing." And he was constantly expressing surprise that he should have influenced the opinion of great scientists to any considerable extent, never realizing that among all the scientists there was none other like himself.

When we turn to the contemplation of Darwin's character, I can only say that no words can give adequate picture to its perfect beauty and rare nobility. I do not believe that any one of ordinary feeling can read Darwin's brief account of his own life, in the short autobiography which he prepared for his children, and the mass of letters which have been collected and edited with devoted care by his distinguished son, Francis,

without being deeply moved by the gentleness, the patience, the humility, the courage and the courtesy which are there revealed. Here was not only one of the greatest thinkers that ever lived, but one of the gentlest, kindest and most lovable of men; not only one of the few intellectual giants in history, but also one of the few ideal characters.

Darwin's home life was inexpressibly beautiful. His relations with his wife and children were full of deep affection and tenderness, and he was regarded by all the members of the family with a touching reverence. One of his daughters writes, "He was passionately attached to his children. To all of us he was the most delightful play-fellow and the most perfect sympathizer. Indeed it is impossible adequately to describe how perfect a relation was his to his family, whether as children or in their later life." And his son adds, "I do not believe he ever spoke an angry word to any of his children in his life, and I am certain that it never entered our heads to disobey him." In fact, he was never too occupied to concern himself with the things which interested or worried his children, and to him they came freely with their troubles and their joys. And when not busy in his laboratory or study, his chief delight was to walk across country with one or two of his children and a dog. For he also loved animals and not only lavished affection upon his dogs, but was on intimate terms with the squirrels and birds in the community. In fact, his affection did not even stop here for he would stroke the petal of a flower

as he might stroke a baby's cheek. And a similar relationship was practiced toward all his friends and his servants, whom he treated with scrupulous courtesy and consideration. In short, he was on the best of terms with all the world, and all the world saw in him a tenderness and a sweetness, a sympathy and a serenity of mind, a loyalty and an affection, which are rare in the minds of men.

And these remarkable characteristics appear more exceptional, when we remember that throughout the whole of his active life, he was a hopeless invalid — not only feeble and weak, but tortured constantly by terrible physical pain. "For nearly forty years," his son tells us, "he never knew one day of the health of ordinary men, and thus life was one long strain against the struggle and weariness of sickness." And yet this disability was borne with such patience and good nature, that "no one except my mother," said his son Francis, "knew the full amount of his suffering." And it was under conditions such as these which, says Huxley, "would have converted nine men out of ten into aimless invalids" that Darwin accomplished these unexampled results; and this too with never a word of complaint or impatience.

I was about to pass on to the contributions which he made to the world, but perhaps I should say just a word about his religion. Mr. Darwin was never what is commonly called a religious man. He rarely attended any church, and when confronted by the great problems of religion, with his characteristic humility, he frankly assumed

the agnostic attitude. He was cruelly and bitterly attacked by the church and no man was more frequently denounced as infidel and atheist. And yet I am sure that you will agree with me when I say that no man was ever more truly religious than he; and if I were assigned the audacious task of revising the calendar of saints, I would be able to find many names which might well be displaced by Charles Darwin.

III

But now having considered his career, his qualifications as a scientist and his character as a man, let us note the contribution he made to the world and understand why he is a man of such tremendous proportions. Two weeks ago I told you that there had been a number of people who believed in and taught the theory of development or evolution, but these were few and scattered because they did not have the facts to substantiate this theory, and because they did not know the influence which brought about the development of a new species; and it was these two things — the facts and the explanation of them — that Darwin gave the world and thus established as a scientific fact the doctrine of evolution.

In the first place then, Darwin presented to the world in his "Origin of Species" the facts which prove the doctrine of evolution to be true, in so far as it is possible for the human mind to establish anything as true. Of course, evolution cannot be proved in the sense that a mathematical

formula can be proved; but we know that it is true because nothing else can explain the facts, while this does explain the facts. It is the only scientific interpretation that has been suggested that fits the facts, and all the facts it fits are its proof. These facts involve such a mass of data that one could spend a lifetime in studying them; and Darwin was the first man to accumulate and arrange them in such manner as to suggest an explanation of existence. Up to this time, these facts had not existed so far as the observation and knowledge of men were concerned. Of course, they had always been present in the world, but no one before had seen them with eyes that understood and read their meaning. In this sense, Darwin's work was absolutely original and remains as one of the colossal achievements of the human brain, equal in every respect to Newton's feat of demonstrating the truth of gravitation. Of course, since Darwin's day, certain of his facts have been modified, and all have been supplemented by a multitude of new facts which have been observed by the many scientists that have followed in his footsteps, but Darwin's data still stand as basic and mark one of the great turning points in the history of human thought.

But there is a second contribution which if possible is even more important than this. I refer to the fact that Darwin not only discovered the data which proved evolution to be true, but he also worked out a theory which explains how the process of development has taken place. It was the total lack of such an explanation, as well

as of material evidence, which had persuaded all naturalists before Darwin's day that evolution could not be accepted as a sound interpretation of the origin of things. So when Darwin, after studying the facts, was convinced that these facts could be explained in no other way than by the theory of evolution, he was at once confronted by the question of explaining this hypothesis. The process of development had apparently taken place, but how? Under what impulse did the change in the stream of life come about? It was easy enough to see how changes were brought about in the life of domestic plants and animals, for this had been achieved for centuries by the process of arbitrary selection. Dogs and horses as well as roses and chrysanthemums had been modified in a hundred different ways by the ingenuity of man in selecting those types which he wanted to preserve and throwing away all the others. Now this same thing had apparently been going on all the while in the world of nature, but in the absence of man as the controlling factor, how could such changes be explained? There must be some principle of selection in the process, but what was it?

It was this mystery that had remained unsolved for years; and it was this mystery which Herbert Spencer said must be solved before one could logically advocate the theory of development. Not only was there no definite evidence that evolution had taken place, but without this principle, it was inconceivable that it should have taken place; and that is why the whole thing appeared so baffling that most scientific men had

definitely given it up. But just as Darwin had discovered the facts, he now worked out a theory to explain these facts; and it is in the discovery of this theory that the real greatness of Darwin must be said ultimately to consist. As John Fiske has said, "It was here that the poetic and creative genius came into play, just as it did in Newton's discovery when the fall of the moon was likened to the fall of the apple." And in a few words this is the theory which Darwin invented. He noticed that in the natural history of plants and animals life tends to multiply much faster than the earth is able to furnish sustenance. This unrestricted multiplication of life results in a competition for the means of existence. Of the multitude of plants and animals produced, only a few in each generation can survive and reproduce their kind. These few which survive are the ones which through some variation are the best adapted to the environment in which they find themselves. These in turn reproduce themselves and those with variations which make for survival continue to live, and in a long period of time these infinitesimal changes eventually produce an entirely new species. And thus there is a "natural selection" which is just as effective as the artificial selection of man; and it is this natural selection in constant operation among all living things, which explains the process of evolution.

Darwin called it the principle of Natural Selection; and after we understand it, like all other great generalizations, it seems so simple that we wonder how men could have lived so long with-

out having thought of it before. Just as man in his breeding of roses or dogs selects the best and allows them to propagate, destroying all the rest; so the struggle for survival among the myriad variations in all forms of organic life selects those which are best fitted to their environment and allows them to propagate, and in the same way destroys the remainder. Thus are constantly created new varieties and eventually new species. Nature does naturally what man does artificially; the determining factor in the process is precisely the same. And thus to his array of evidence in demonstration of his theory, Darwin added an explanation of the process which the evidence proved to be true. It was this later step following the first, which raised the evolution theory from the rank of an interesting but unfounded philosophical speculation to that of an impregnable scientific discovery. What wonder is it that with two such important intellectual achievements to his credit the name of Charles Darwin, by the common consent of intelligent people, is placed side by side with such names as Aristotle in the ancient world and Newton in the modern.

Such is the story of the life and character and significance of this great man. To Charles Darwin, the scientist, the world owes the revelation of one of the greatest truths that the mind of man has ever conceived; to Charles Darwin, the man, the world owes the equally great and rare revelation of one of the noblest and sweetest lives that man has ever lived. And it is a great privilege thus to recall the noble characteristics of

this man; not in order to perpetuate his memory, but that we may be reminded of the ideal according to which we must shape our lives if we would live nobly and helpfully, for "he was a man, take him for all in all, we shall not see his like again." Indeed it is not necessary to seek to perpetuate his memory. For while no man was ever simpler or less ostentatious than Darwin; while no man was ever more indifferent to fame or personal glory; while no man ever lived a more quiet or less pretentious life; yet I venture to say that if the time foreseen by Macauley ever comes, when a New Zealander shall sit upon a broken arch of London Bridge and gaze upon the ruins of St. Paul's cathedral, he will think of Charles Darwin as inevitably as the man today who sits upon a broken pillar of the Acropolis and gazes upon the ruins of the Parthenon thinks of Aristotle.

III.

ALFRED RUSSELL WALLACE

Of the illustrious group of men to whom we owe the foundations of the new epoch of evolutionary thought, Alfred Russell Wallace is perhaps the least known, though by no means the least important. During the whole of his life as well as since his death, his career has been more or less overshadowed by more dominating figures, no doubt due in part to his extreme shyness and reticence. Here is one of the most important scientific men of the last century, who all by himself reached the same conclusions in regard to the origin of species as Mr. Darwin, and yet whose name is scarcely known by the majority of people. Perhaps I happen to be better acquainted with Mr. Wallace and have a higher regard for him that most people because it was through one of his books that I became acquainted with the theory of evolution. When I entered college, I had never heard about the theory of evolution, and to me Darwin was merely a name; but immediately upon my arrival there, I came in contact with the evolutionary theory

and the work of Charles Darwin. I was interested and wanted to know more about it. I went to the library and found a book called "Darwinism" by Alfred Russell Wallace, which immediately converted me to the theory and which stimulated an interest in Mr. Wallace as well as in evolution. From that time on I kept in touch with the work and career of Mr. Wallace; and have always felt a pathetic interest in his subordination to Darwin which he so uncomplainingly suffered all his life, and the essential justice of which he was the first to recognize.

Perhaps my interest has been heightened too by the fact that Mr. Wallace and I have been to some extent contemporary. Practically all the other great giants of the Victorian era passed away before I was old enough to know very much about them. Wallace alone remained and wrote after I had reached maturity; for you must remember that it is only twelve years since Mr. Wallace died, and that he was virile and active to the very end, so that he really was an intellectual force in our age as well as in his own. In 1907, when he was eighty-five years old, he published his book on "Man's Place in the Universe," which set the whole world talking anew about the problem of evolution. Three years later in his eighty-eighth year, he wrote the "World of Life," which was also a work of epoch making significance. And in 1913, when he had already passed his ninetieth birthday, he published his "Social Environment and Moral Progress," which constitutes one of the most radical and thorough-

going discussions of the modern social question that has ever appeared. And even after his death, there was published another book, "The Revolt of Democracy," which he finished only a few days before he died, and which was another critical analysis of the political and economic conditions of our time. And the very titles of these books, written in his latter years, show that he has other claims to be remembered by posterity than his scientific career. He was also a fearless social reformer who vigorously laid the axe to the root of great evils which flourished, and still flourish in our midst. Nothing did him more credit than his late sociological studies, and fearless identification as a result of those studies with the most advanced radical movements of his time. For Wallace was not only a scientist; he was a prophet and reformer as well; he had matchless courage, a flaming zeal for righteousness, a passionate love not only for abstract truth but for men, and withal a gentleness of heart, which made him a character of rare nobility.

I

Mr. Wallace was born January 8, 1823, in the town of Usk in Monmouthshire, England. He was the last but one in a family of nine children. He attended the public schools for several years, but tells us in his autobiography that he learned very little there. He did, however, learn much in the town library where he spent many of his leisure hours. He was very fond of reading and devour-

ed all the books he could lay his hands on. At the age of fourteen, he was taken out of school and sent to live with his elder brother, John, in London. Here he came in contact with people of advanced political and religious opinions, and read such works as Paine's "Age of Reason." He also met followers of Robert Owen, the founder of the Socialist movement in England. Owen's fundamental principle was that a man's character was formed *for* him by heredity and environment, and not *by* him. Young Wallace, whose upbringing had been strictly orthodox, was greatly impressed by these doctrines; and the ideas they inspired, though latent for fifty years, no doubt largely influenced his thought and writings when he ultimately turned his attention from purely scientific to political and social subjects. Later he spent four years with his eldest brother, who was a surveyor; and his work was in connection with the Enclosure Acts, by which the landlords were permitted to enclose waste lands under the pretext of cultivating them. The result was that the cottagers were deprived of the means of keeping their few cattle and pigs, while the enclosed land was not cultivated at all, but was usually turned into game preserves. Thus the poor people were driven to the towns, where unfit to compete, they sank into the deeper poverty of the slums. I refer to this observation because this experience evidently had much to do with his later theory of land nationalization.

Another result of this out-door life was a very keen interest in flowers and insects which every-

where abounded. This interest soon developed into a serious study, in pursuit of which he started a scientific collection of the wild flowers and insects which he found. In 1843 his father died, and there being little in the way of surveying to do, Wallace obtained a situation as drawing master at a school in Leicester. This was an important move because it was here that he met Henry Bates, with whom he commenced his tropical travels four years later—so momentous not only for himself but for the whole world. It was here also that he read Malthus' "Principles of Population" which, after his long study of tropical plants and animals, supplied the inspiration which clinched the theory of natural selection which he originated in 1858.

Bates and Wallace finally decided to go to the tropics to study the birds and insects—a trip suggested by Darwin's account of his voyage on the Beagle—and they sailed from Liverpool in April, 1848. The four and a half years spent in South America are fully described in his "Travels on the Amazon and Rio Negro." There were many hardships connected with the whole of this period, but the worst was on the way home. After being at sea a week, their ship caught fire, and all hands had to take to the boats. The vessel with all its cargo, including Wallace's collection, was completely destroyed. After being tossed about for ten days in a life boat, they were picked up by an old vessel that was unseaworthy; and after eighty-two days, in a semi-starved condition, Wallace, with only the clothes he stood in,

reached land. The results of his four years' toil and hardships were irretrievably lost. Without much imagination, one can picture his feelings under such a crushing blow. But he refused to surrender to vain regret, and soon after his return, he wrote the story of his travels, which was published in 1853.

In 1854, he again left England and sailed for Singapore, where he began his eight years' wanderings among the Islands of the Malay Archipelago, an account of which is recorded in his most popular work of that name. Here he wandered about absolutely alone for more than 14,000 miles and collected 125,660 specimens of natural history, although much of his time was wasted through illness common in this country. It was while staying in Sarawk in 1855 that he wrote his first article on the origin of species, in which he declares that species develop from other species. And for the next three years, he tells us, the question of how changes of species could be brought about was rarely out of his mind. Finally, in 1858, when he was lying muffled in blankets in the cold fit of a severe attack of fever, pondering over the subject, and recollecting what Malthus had written about the population in relation to the food supply, he says, "It suddenly flashed upon me that this self-acting process would necessarily improve the race, because in every generation the inferior would inevitably be killed off and the superior would remain—that is, the fittest would survive. Then at once I seemed to see the whole effect of this in the plant and animal

world." The theory was thought out during the rest of the ague fit, drafted the same evening, written out in full during the two succeeding evenings, and sent to Darwin, known to be the greatest naturalist in England at that time. The story of the relationship between Wallace and Darwin as the result of this I shall speak of in a moment.

As their theories developed, there were of course differences of opinion, most of them of minor importance. The two principal differences were—first, Darwin thought that natural selection alone was sufficient to explain the development of man in all his aspects from some lower form. Wallace, while believing that man was so developed, thought that as an intellectual and moral being, some other influence—some "spiritual influx"—was required to account for his special mental and spiritual nature. The only other important matter on which these two great scientists differed was the question of the inheritance of acquired characteristics. Darwin always believed that the effects of use or disuse, of climate, of food, and so forth on the individual were transmitted to the offspring; while Wallace was convinced that acquired characteristics were not inherited. The judgment of time seems to be that in the first case Darwin was right and in the second, Wallace.

After writing a number of scientific books, his interest turned to social problems and the greater part of his later life was devoted to this end. In 1881, he published his noted book on the "Nationalization of Land," in which he argued

the necessity of the state ownership of land, a principle which he had originated long before the appearance of Henry George's work. This was followed by his strong denunciation of vaccination. For seven years, he labored to show medical and scientific men that statistics proved beyond doubt the futility of this measure to prevent disease. His treatise on this subject was recognized by the scientists at that time as absolutely unanswerable, and it is today the chief authority for those who oppose vaccination. This was published in 1885. About this same time, he published his "Miracles and Modern Spiritualism" in which is given an account of the reasons which induced him to accept a belief which is shared by so few scientific men, namely, a belief in communication with the dead. These were followed by those three very notable books, which I have already mentioned—the first being "The Wonderful Century" which was an account of the marvelous advances in scientific knowledge and invention that had taken place during the nineteenth century, of most of which he had been an eyewitness. Then followed "The World of Life" and "Man's Place in the Universe" in which he sets forth the ideas of theistic evolution, and in which he sums up and completes his fifty years of thought and labor in behalf of the theory of evolution, extending the scope of the theory to explain many of the phenomena of living things hitherto considered to be outside its range. His last noted book was "Social Environment and Moral Progress" in which he says that there is no evidence

of any advancement in man's intellectual or ethical qualifications during the whole historic period, and states his belief that no real improvement is possible until we organize society on a rational basis of mutual help, instead of our present system of mutual antagonism and degrading competition.

Alfred Russell Wallace died November 7, 1913, almost ninety-one years of age. It was suggested that he be buried in Westminster Abbey besides Charles Darwin; but Mrs. Wallace, expressing his own wishes, did not desire it. However, two years later, a medallion of him was placed in the Abbey next to that of Darwin, with whose great name his own will ever be linked.

II

Of course, the most prominent thing in Wallace's life was his connection with Darwin in the discovery of the theory of evolution through natural selection; and I want to go somewhat into detail in regard to this remarkable episode today—first because it is one of the most dramatic incidents in the history of human thought, and also because it reveals so wonderfully the characters of the two men who were involved. I have during the last week gone over the whole of the Darwin-Wallace correspondence, and I have never read anything more interesting or more touching. You will find it covering almost two hundred pages of that large book entitled,

"Alfred Russell Wallace: Letters and Reminiscences" by James Marchant.

You will remember that Darwin took a five years' voyage around the world on the Beagle, and that, as a result of his observations of various forms of plant and animal life, he became convinced that the generally accepted explanation of the origin and development of earthly life was false; and immediately upon his return to England, he began the stupendous task of investigating this great question. For twenty years, he worked at the problem with a patience and a persistence beyond the comprehension of most of us. He made observations, collected facts, and worked experiments almost innumerable. All the while he came nearer and nearer to the great truth which had already dawned upon his mind while on the voyage,—namely, that the various forms of earthly life had originated not as the result of special creation by a personal God, but by the process of gradual development through natural selection. He worked all alone, confiding his theory to only three men—Hooker, Lyell and Asa Gray. These men suggested to him that he announce his theory lest some one else reach the same conclusions and precede him; but he always refused, being determined to make no announcement until his theories were fully established by the facts.

Now while Darwin was working so faithfully, this other young scientist, Alfred Russell Wallace, who was known to Darwin through friendship as well as community of interest, departed for the far-distant Malay Archipelago, and was hidden in

this remote corner of the globe for eight years, studying various forms of life just as Darwin had studied them. And here Wallace went through the same experience as Darwin in having become convinced that the origin of species had not been satisfactorily explained; and applied himself also to the task of finding the true explanation. Year after year he toiled at the problem, without any knowledge of what Darwin was doing; and at last in the year 1858, what he believed was the solution of the problem suddenly dawned upon him. Immediately he set down his theory in a brief essay, as I related a moment ago, and strangest of all things, sent it to Charles Darwin. And when Darwin opened his friend's communication and read the article, he discovered to his unbounded astonishment, that Wallace had outlined a theory, identical not only in idea, but in many cases even in expression with that upon which he had been working for so many years. Neither man knew what the other had been doing, and yet both had faced the same problem, observed the same facts, and reached the same conclusion.

The dramatic character of this discovery of the theory of natural selection at practically the same time, by men working altogether independently of each other and at opposite sides of the earth, has never been surpassed in the history of human thought. It is the most astonishing coincidence in history. But more remarkable even than the thing itself was the way in which it was treated by the two men concerned. Imagine the feelings of Darwin when he read the paper of

Wallace, and found that the labors of a lifetime had in a sense been undone! On the other hand, imagine the sensations of Wallace when he learned that he had sent his paper to the one man in all the world who had anticipated his theory and foreseen his conclusions. Never were there more promising conditions for endless jealousy and strife. One would naturally expect another Commodore Peary and Captain Cook episode; but as a matter of fact never did two men maintain an attitude toward each other more ideal. It was a double incarnation of self-abnegation and generosity.

When Darwin received Wallace's treatise, he resolved at once to publish it without any comment of his own, and silently abandon any fame for his labor of more than twenty years; and it was only as a result of the earnest demands of his friends, that he was persuaded to present with Wallace's essay a paper of his own which had been written sixteen years before; and these two papers were read together before the Linnaean Society in July, 1858. Then in the "Origin of Species" which he published later, and in all his other volumes in which he did more than any other man to establish the truth of the doctrine, Darwin made special effort to include Wallace in all the credit which belonged to the achievement, and to refer to him as an equal authority with himself on the new doctrine. And the attitude of Wallace was quite as remarkable. You perhaps think that it was easy for Darwin to be generous, when the world's praise had all been showered

upon him and the new doctrine went by his name; if so, then it was equally hard for Wallace to remain unperturbed and sweet tempered when he saw practically all the fruit of his labors reaped by another man. And yet throughout all his long life, he never showed the slightest trace of jealousy or resentment. He always declared that Darwin was the real discoverer of the theory of evolution; and insisted that even though he had reached the same conclusion as Darwin unaided and alone, yet he could never have presented the wealth of illustration and the elaboration of argument which made the "Origin of Species" one of the few great books of the world; and that Darwin was, therefore, entitled to all the honor and fame which had been granted him. He gladly accepted the word Darwinism to describe the theory which he had independently discovered, and even chose this term as the title for his most important work on the subject.

As long as Darwin lived, they were loyal and devoted friends; and in the thirty years that intervened between Darwin's death and his own, there was no man who did more to magnify Darwin's memory, or who more eagerly sprang to the defense of his work whenever it was called into question. One may search the history of mankind in vain for anything more noble or more generous than the relation of these two men. Face to face with a condition which time and again has turned the noblest men into bitter foes and contending rivals, Darwin and Wallace clasped hands as comrades, and lived for thirty years as the closest

friends. In a letter to Wallace in 1870, Darwin said, "I hope it is a satisfaction to you to reflect—and very few things in my life have been more satisfactory to me—that we have never felt any jealously toward each other, though in some senses rivals. I believe I can say this of myself in truth, and I am absolutely sure that it is true of you." In comment on this letter, Wallace writes, "To have thus inspired and retained this friendly feeling, notwithstanding our many differences of opinion, I feel to be one of the greatest honors of my life." And if you care to read the letters of Darwin and Wallace, not only to one another but to mutual friends, you will find all the while examples of nothing but affectionate love and warm admiration. It seems to me that a study of the relationship of these two men is a sermon in itself. The Bible may have its David and Jonathan, but science has its Darwin and Wallace.

III

In addition to this dramatic episode of Wallace's discovery of what is everywhere known as Darwinism, there are just two phases of his work to which I wish to call your attention this morning: first, because they constitute his distinct contribution to the field of evolution; and second, because they carry us into the larger field of social and ethical life.

The first of these is his life-long insistence upon interpreting the evolutionary process in

terms of theism. When the theory of evolution first claimed the attention of men, the contrast between the old theory of direct creation and the new theory of natural selection was so great that it was immediately assumed that the doctrine of evolution meant the end of religion. To accept evolution was equivalent to denying the existence of God. And there were some evolutionists, like Haeckel, who declared in open fashion that the hypothesis of God was now unnecessary as an explanation of the world and its abounding life. He maintained that in the original fire-mist were little centers of energy; and the interaction between the atoms of matter and the centers of energy upon each other, controlled by the unvarying operation of natural law, had produced the world and all that we find therein; and that there is no need of any power outside of or beyond this.

Not all the evolutionists agreed with this purely materialistic view. Huxley, for example, assumed what he called the agnostic attitude, asserting that the whole question of the origin of life lay beyond the limits of human knowledge, and that it was impossible for science to determine whether God was a reality or not. "The doctrine of evolution," he said, "is neither theistic nor atheistic. It simply has no more to do with theism than the first book of Euclid has." Darwin went a little farther by asserting that "the theory of evolution is quite compatible with belief in God"; but he frankly confessed himself troubled by this problem of God and never attempted to work out the relation of their compatibility.

Spencer went the farthest of all by laying down as one of the first principles of his philosophy, "an infinite and eternal energy, mainifested to us through all phenomena"; but when he came to define the meaning of this power, he was forced to admit that it transcended our understanding and must therefore ever remain unknowable. So you see the whole trend of the argument for evolution was unfavorable to the theistic idea, at least in its popular religious sense, and there was much reason for the contention that the new doctrine of life was inimicable to the idea of God.

And it was here that Wallace distinguished himself, whether rightly or wrongly we are not now discussing, from all the other great evolutionists by insisting upon the proposition that the idea of God is not only compatible with the doctrine of evolution, but absolutely essential to the understanding of that doctrine; and by his interpretation of God, not in the vague definition of most scientists, but in the positive terms of personality. Wallace declared from the very beginning of his work that he was neither an atheist nor an agnostic, but a theist—and a theist *because* of the fact, and not *in spite of* the fact, that he was an evolutionist. I have not time this morning to give you the line of argument followed by Wallace in reaching this conclusion, which you can find very clearly outlined in his book on "The World of Life"; but as a result of his studies in the world of nature, he comes to the sweeping conclusion that in all and through all and over all there must be "an organizing and directing

Life-principle." "I argue," he says, "that these phenomena necessarily imply first: a Creative Power, which so constituted matter as to render these marvels possible; next, a Directive Mind, which is demanded at every step of the process we call growth; and lastly, an Ultimate Purpose in the very existence of the whole vast world of life." All of which means that Wallace, as a result of his studies of evolution, found himself forced to believe in God as the only adequate explanation and source of the phenomena of the natural world. Especially did he believe that it was impossible to account for man, as a mental and moral being, by the process of natural selection; and insisted that the only thing that can explain the origin of man upon the earth was "the influx" into the evolutionary process at some fateful moment of the past "of some portion of the spirit of Deity."

And this is the first of Wallace's distinctive contributions to, or at least distinctive interpretations of, the doctrine of evolution—his interpretation of the familiar facts of nature and of human nature in terms of theism as contrasted with atheism or agnosticism. Many of us may question his arguments in favor of such a theism, and some of us may repudiate his conclusions entirely. Personally I cannot accept any of the argument —it savors too much of the old theological argument from design, and is in contradiction to the basic principle of modern science; and I feel sure that if Mr. Wallace had given place in his theory of evolution to other factors than that of natural

selection, he would have found that man and the animals are more closely related on the mental and moral side than he imagined. But however we differ from him, we must give him credit for producing the finest argument in favor of theistic evolution that has been presented anywhere; and this, I say, is in direct contrast with all the other great evolutionary thinkers of the last century with the exception of John Fiske.

I am more interested, however, in stressing the second of his distinct contributions to the theory. Away back in 1864, Wallace published a paper in the Anthropological Review, in which he pointed out that with the arrival of man upon the earth, with his marvelous mental and moral faculties, a wholly new element was introduced into the problem of natural selection. In fact, he said man was so different in all his faculties and powers from all the animals which had preceded and surrounded him, that he practically made the process of evolution a wholly different thing from what it had been before. All other creatures in the organic world were almost entirely dependent upon the environment in which they lived. The whole problem of existence for them was simply that of adaptation to the changing conditions of this environment. Every living organism succeeded in surviving and propagating its kind insofar as it succeeded in changing its bodily form and structure in strict adaptation to the successive changes in the surrounding world. In short, the environment caused changes in the living creatures, but the creatures had no effect upon

the environment. Now this condition, said Wallace, was entirely reversed when man came upon the scene. Unlike all other forms of life, man had certain mental and moral qualities which enabled him to solve the problem of survival, not by adapting himself to the environment but by adapting the environment to himself. It was no longer necessary for him to change his physical form to meet the requirements of the changing conditions of the world. He possessed a new force—an intellect—and with this he could transform nature, and make her serve his own particular needs. With this mind, he made clothing to protect his body from the cold, a home to shelter his head from the storm, a fire to warm his body and cook his food, weapons to slay the deer and fight the lion, and implements to till the soil. Now this, said Wallace, constituted an unparalleled revolution in the history of the world. A being had arisen who was no longer subject to the world, but who had become master of the world. The world was his to do with as he saw fit; and that man, and that race of men, which succeeded in creating an environment more favorable to their development would survive in the struggle for existence.

Of course, this is a commonplace of our thought today, but it was discovered and announced by Wallace as early as 1864; and this indeed was a very great contribution to the world's thought, not so much because of what it is in itself, but because of the results which it produced. Upon this thought rests our whole theory

of social reform as well as our religion which we call Humanism; and it was this contribution of Wallace's which has made the age in which we are living the "Age of Social Revolution." This is perhaps best understood by noting how this principle worked itself out in the mind of Wallace himself. The next step in his argument naturally was a study not merely of man's natural environment, but of his social environment—and it is this fact which explains the remarkable feature of Wallace's old age; namely, that he had become in his latter years an enthusiastic and uncompromising radical social reformer. What kind of an environment is man creating for himself, asked Wallace, in the society in which he is living? And when he sought the answer to this question he found a situation which brought forth a cry of horror and alarm that reverberated from one end of the world to the other; he issued an appeal to men to arise in their might and reorganize society; and not only that, but he pointed out what he believed to be the changes in the social order which must be effected as the conditions of human survival.

All of this he sets forth in that last book, "Social Environment and Moral Progress," which was written in his ninety-first year, a book which I read when published and which gave me my first logical reason for social improvement. The book first of all presents the biological principle of man's control over environment, which I have just been describing; then it reveals the facts regarding the social conditions of our time; and

finally presents the most fearful arraignment of our existing civilization that I believe has ever been printed. Wallace speaks of the unsanitary dwellings in which people live, and the life-destroying trades in which they work; he denounces child-labor, white slavery, the liquor traffic and war; he points out the dishonesty of our commercial life and the injustice of our administration of law; he exposes the horrors of poverty and disease, and the increasing moral degeneration of our times. And summing up his indictment of our society in one terrible judgment, he declares, "Taking account of all these undoubted facts, many of which are so gross, so terrible, that they cannot be overstated, it is not too much to say that our whole system of society is rotten from top to bottom, and the social environment as a whole, the worst that the world has ever seen."

We do not need to agree with the whole of this terrible indictment, but we cannot help marveling at this wonderful old man who thus reads the indictment of his times and, like a prophet of Israel, cries down upon his people the woes of Jehovah. But the still more remarkable thing is that unlike most men of his age, he is not satisfied merely to denounce, but moves on to solve the problem which has been raised by the facts that he has observed. And it is a discussion of this question of what to do, which constitutes the third section of the book. Here he lays the axe to the very roots of our society, and presents a program so radical as to entirely reconstruct our

civilization. It is not necessary for me to present this program; I am merely seeking to demonstrate his second great contribution to the world of thought—his discovery of the ability of man alone among all creatures to solve the problem of survival by changing the environment instead of changing himself, and his application of this discovery to the problems presented by the social conditions of modern life. And I should like here at the end to call your attention to the fact that this led him to a purely humanistic attitude toward life. Wallace may have been a theist in respect to causes, but he was a humanist in respect to methods. He says, "There is no doubt that all the evil in the world is directly due to man, not to God, and that when we once realize this, we shall be able not only to eliminate the whole of it, but create conditions under which our present evil propensities and passions will add to the varieties and capabilities of human nature and the enjoyment of life by all."

Thus we must think of Alfred Russell Wallace as a well-rounded man. He was not the recluse calmly spinning theories from a bewildering chaos of observations and building up isolated facts into the unity of a great and illuminating conception in the silence and solitude of his laboratory, unmindful of the great world of evil and sorrow without. He could say with Darwin, "I was born a naturalist"; but we can add that his heart was on fire with love for the toiling masses of people. He had felt the intense joy of discovering a splendid generalization, which not only

worked a complete revolution in biological science, but has also illuminated the whole field of human knowledge. Yet his greatest ambition was to improve the cruel conditions under which thousands of his fellow creatures suffered and died, and to make their lives sweeter and happier. His mind was great enough and his heart large enough to encompass all that lies within the visible horizon of human thought and activity; and even in his old age, he lived on the topmost peaks, eagerly looking for the horizon beyond.

IV.

HERBERT SPENCER

No thinker of the last century has exerted a deeper, though often unrecognized, influence on thought in general than Herbert Spencer. To the historian of the future, it is very probable that the last half of the nineteenth century will be recognized as the era of evolution; because during those fifty momentous years the doctrine of evolution accomplished its conquest of the world. Most people connect this great revolution in thought mainly with the name of Charles Darwin; but in that respect they are, to a great extent, mistaken. Darwin applied it only to organic life; but Spencer extended it to comprise the whole universe. To Darwin we owe only the minor principle of the origin of species by natural selection; to Herbert Spencer we owe the general doctrine of evolution as a whole. Darwin confined, and wisely so, his attention almost entirely to the field of plant and animal life, or to human origins viewed purely from the anatomical standpoint; whereas Herbert Spencer taught us that still wider and deeper view of evolution which recognizes its action in suns

and worlds, in plants and animals, in minds and ideas, in social institutions and governments, in religions and morals, and in all the various products of human organization and human activity.

How does it happen then that while the name of Darwin is familiar to all, the name of Spencer is scarcely known outside of academic circles? I think there are two reasons for this curious fact. In the first place, Darwin touched directly upon the origin of man and of life in general, which caught the public attention at once, and which aroused that special kind of religious opposition which is the best possible advertisement for a man or a book. He had the good luck to come into direct conflict with the book of Genesis. In the second place, Darwin was also fortunate in finding his own name attached immediately to his particular views. From the beginning, everybody talked of Darwinism, Darwinians, the Darwinian theory; but few people have ever described themselves as Spencerians, and still fewer ever speak of the Spencerian doctrine. It is Spencer's ideas that have conquered the world; it is his phrases that are in everybody's mouth, not the name of their discoverer. No philosopher has ever been consciously or unconsciously quoted so much; no philosopher's ideas have ever more thoroughly permeated humanity; and yet the great majority of people are absolutely ignorant of the source of these words and ideas.

If any one doubts the supremacy of Herbert Spencer among the organizing thinkers and teachers of our time, let him think of the numerous

phrases which sum up the current thought of today, and he will find that almost every one of them bears on its very face Mr. Spencer's trade mark. Evolution is the dominating fact of our age. Well, most people are not aware of it, but the use of this word in its modern sense is wholly and solely due to Mr. Spencer. Again, the man in the street talks glibly nowadays of the "survival of the fittest." Probably he thinks the phrase is Darwin's, but it is not. It was invented by Mr. Spencer, as a better one than Darwin's "natural selection." Once more, everybody employes the words "adaptation to the environment" as a common phrase of everyday life; few know that it is entirely and exclusively Mr. Spencer's invention. The fact is that this great philosopher has supplied our speech with all the current phraseology of evolution and the evolutionary concepts. With his tremendous faculty of generalization, he was able to sum up the results of the process in a single neat and comprehensive formula; and his phrases have been accepted by the public mind with such favor that they have drowned out the name of the author. The very success of his thinking has obscured the great thinker. He has imposed his opinions upon us to so great an extent that most people now think of them as their own, or at least as common property. Ideas, which when Spencer began to write were startling heresies, are nowadays so familiar that only special students of the history of thought ever dream of crediting them to their actual author. A biographical sketch of a man who has so pro-

foundly influenced the course of human thinking must surely be of interest to those who have drunk so deeply at his fount—who without knowing it think his thoughts and repeat his words.

I

The life of a philosopher is never very exciting, and that of Herbert Spencer is unusually plain and simple. It is essentially the story of a thinker, of which the most conspicuous marks are the periodical publication of books, in which he gave his thoughts to the world. He was born in Derby, England, on April 27, 1820. He came from a stock long marked by intellectual integrity, fearlessness, and independence, whence Spencer explains he got his "ingrained non-conformity." His father was an unusually unconventional man. He taught school and had views of education far in advance of his time. His mother, who does not seem to have influenced him to any extent, was very different from her husband, as patient and gentle as he was irritable and aggressively independent. They do not seem to have been very happy together, and their union was not blessed with many children who survived; although nine were born to them, only one, Herbert, passed the stage of infancy.

His education was very unusual and was marked by the lack of coercion. The boy was left a great deal to himself, and he followed his bent toward scientific information, learning also a little English and arithmetic. At the age of thirteen

he was sent to his uncle, Rev. Thomas Spencer, to be tutored; but the discipline of this home seemed so hard that he ran away to his father's, walking a hundred and fifty miles in three days with hardly any sleep or food. However, after awhile, he returned to his uncle and remained for the next three years. This was the end of his systematic education, which certainly was very incomplete. The original intention of sending him to Cambridge University was relinquished, as the uncle came to realize the lad's unfitness for a university career.

When he began to earn his living at the age of sixteen, he knew, therefore, very little about the things which are taught in school, but he probably knew more than the average boy of his age in other ways, for he had been a more than usually careful observer of natural phenomena and of human life. For some years he worked successively as an assistant schoolmaster (for three months), as an engineer; and after a vain attempt to earn a living as a literary man, he finally became, in 1848, sub-editor of the Economist. This last position had the advantage of bringing him into touch with many eminent men of his day—men like Huxley, Tyndall, and Lewes. During all these years, he had carried on desultory reading; he had made quite a number of trivial mechanical inventions; he had done some writing and a considerable amount of solitary thinking. The editing of the Economist left him time enough to do some writing, and while here he finished his first book, "Social Statics," which appeared in 1851. This volume contained an extremely fresh

and original treatment of social problems upon the fundamental principle that "Every man is free to do whatsoever he wills, provided he does not infringe the equal freedom of any other man." This was the basis of his extreme individualism which formed the foundation of all his political writings.

In 1853, having inherited five hundred pounds from his uncle, he abandoned this position and determined to support himself by his own literary work, which is always a hazardous decision, and in his case proved very unsuccessful. It was necessary throughout the remainder of his career for his friends constantly to come to his support in one way or another. He now began a series of essays which many critics regard as his best work. One of them was on "The Development Hypothesis," which contained an argument for evolution of striking power and originality. Still more remarkable was the article on "Progress: Its Law and Cause," which appeared in the Westminister Review in 1857, maintaining for the first time that evolution is a universal process. It was during this period also that he wrote his second important work, "The Principles of Psychology," in which the problems of mind were approached and discussed from the evolutionary point of veiw, which was indeed the point of view from which he now regarded every question. And this book appeared in 1855 — four years before the "Origin of Species." The immense strain in writing this book produced a nervous collapse which caused a suspension of labor for two years, and

from which he never recovered. From this time on, during which all his great work was done, to the end, he was a victim of dyspepsia and insomnia and of the hypochondria which was the distressing, though natural, result of a shattered nervous system.

The year 1860, to which we have now come, marks the great crisis in Spencer's life; and, beyond this, is forever memorable in the history of modern thought, for it was this year which witnessed the publication of the prospectus of his philosophic system, which was to be a synthesis of the whole compendium of human knowledge, based upon the unifying principle of evolution. It was to deal first with cosmic evolution, go on to the evolution of organic nature — the development of various plants and animals, the origin and growth of mind and the laws of psychology. Thence it was to proceed to the then unknown science of sociology — dealing with the development of political, ecclesiastic and industrial organizations, and those by-products such as language, science and arts, whose evolution had never as yet been suggested; to be finished with a treatment of morals as the laws of social organization, growing out of human experience, instead of arbitrary precepts of a divine being, another thing which had never before been attempted.

The sacrifices involved in the preparation and production of this gigantic work were little short of heroic. In the first place, he was in poverty. His previous writings had brought him nothing, and little was to be expected from these volumes

as they appeared. Beyond and worse than this, he was nervously impaired so that three hours a day was all that he could safely rely upon, and with the best luck he estimated that it would take twenty years of ceaseless effort. As it turned out, his health became gradually worse and it took him thirty-six years. I cannot go into detail in regard to the obstacles and difficulties of this period; I can only say that whatever may be your opinion of the Synthetic Philosophy as a body of doctrine, there is a personal grandeur about its production which inspires admiration. As a monument of quiet courage and perseverance, of self-sacrifice and entire consecration to the pursuit of a great ideal, it stands almost without a rival in the history of the world's grandest achievements. Spencer's place is for all time among those heroes of moral effort, struggle and conquest, who delight the minds of men.

From this time on, the history of the man is practically merged in the history of his work; and the dates of importance are those of the publication of the various books making up the proposed series. During these years, his outer life was quiet and uneventful. Never married, and after the death of his mother in 1867, without relatives, he lived until 1886 in boarding houses in London. About this time, he established himself in a home, and his health became so bad that he could no longer stand the strain of writing, and henceforth, dictated all his work to an amanuensis. This was done in the morning, while much of his afternoons was spent at the Athaneum Club. His even-

ings were mostly spent at the Queen's Gardens where he listened to music, of which he was extremely fond, and in which he found his principal solace as ill-health made all other distractions impossible. Into general society he seldom went, his refusal being prompted not by any natural fondness for seclusion, but by the nervous ills —both real and imaginary — which social excitement entailed, and the interruption of his work. Of external events during this period, the most important was his visit to the United States in 1882.

After the completion of his work, he lapsed into complete invalidism and ceased to have much desire to continue an existence which year by year became an increasing burden. At length, he became overwhelmed by his infirmities, and symptoms of aphasia presented themselves. During the afternoon of Dec. 7, 1903, he fell gradually into unconsciousness and passed quietly away in the early morning of the following day. In accordance with his directions, he was cremated without any religious ceremony, no mourning was worn and a secular address was delivered by Mr. Leonard Courtnay. The ashes were subsequently buried in Highgate cemetery. He died feeling that his life had been spent in vain. That part of his gospel which he considered of greatest importance had not taken hold. All his life he had fought socialism, and it was yearly gaining ground. Signs of reaction were everywhere manifest in religion, politics and society. Militarism and imperialism were rampant, and the great nations of the world,

dominated by a sordid and materialistic spirit, were moving farther and farther away from what he had always proclaimed to be the true principles of sanity and righteousness. All these things filled him with sorrow and alarm and made his last days distressing and pathetic.

II

Physically, Mr. Spencer was a tall man with a large head and a broad forehead which to the end remained unwrinkled. He was gaunt and very thin, and his body so frail that it seemed unable to support the weight of his head, which his friends say looked like a large globe. His character no doubt was largely determined by his physical frailty. He had a form of neurasthenia which made it impossible for him to sleep at night. He himself thought it the result of congestion of the blood in the brain; and so his custom was to dictate for fifteen or twenty minutes and then indulge in some form of exercise for a like period to relieve the congestion. He had to avoid every possible excitement—even novel reading, of which he was very fond, was too much for him. It was this fact which caused him to use ear pads by means of which, in the midst of conversation, he was able to close out the sound of his friends' voices. He would listen until he felt the strain was too much, and then he would close his ears. This frequently stopped the conversation, when he would remark, "Go right on talking, I can't hear a word you say."

He is generally thought of as a crabbed, hypochondriac old bachelor, but his eccentricities really had a physical basis. Even his "abnormal tendency to criticism," as he himself called it, and his abnormal irritability and sharpness of tongue, were really due to physical disability, coupled with his intolerance for the prejudices and conventions of everyday life. For Spencer was by nature a rebel and disliked authority of any kind. He was a man of immensely strong individual personality, which was the basis of his doctrine of social freedom. He could not bear to have his liberty of thought or action in any way curtailed. It was also the organic basis of his deadly opposition to militarism; he could not conceive of a man submitting himself to the orders of a drill-sargeant. It also determined the method of his work, which resulted in supreme egoism and dogmatism. He read very few books and only those that were in harmony with his views. Unlike most men who acquaint themselves with all the literature of the field before writing a book, Spencer approached a subject in ignorance of what others thought about it.

Emotionally he was somewhat cold and so is frequently referred to as having no heart. This, however, is not entirely correct. He had a heart but it was absorbed in his work rather than in people. He had very little affection for human beings, and never seems to have fallen in love. The only woman with whom he was ever at all intimate was George Eliot, and he tells us that he never contemplated marrying her because while

she had the intellectual and emotional traits necessary, she lacked the physical beauty which, he said, "is a sine qua non with me." But while he lacked affection, he was sincere to the last degree —a virtue which characterized not only his philosophical writings but his every action and utterance in the smallest detail of life and conversation, and it was this which was at the bottom of much of his lack of social grace and tact. But these limitations must never be allowed to blind us to his splendid positive qualities. His uprightness, purity and scrupulous honesty, even in the pettiest details; his conscientiousness, his integrity and single-hearted devotion to truth, filled all who knew him intimately with warm admiration, so that it is hardly too much to say that his moral greatness did not fall short of his intellectual greatness. And it must be remembered that his predominate sentiment was that peer of all the virtues—Justice—which he made the keystone of his ethical system; and if in his strict adherence to this supreme principle, he sometimes seemed exacting in the demands which he made upon others, it must always be remembered that unlike many professed teachers, he did not lower his standards when he applied them to himself. He always strove consistently and courageously to live by his own creed.

The mind of Spencer like his character was a singular instrument. It needed but a few guiding principles for its direction, in the light of which all his writings may be understood. In the main, these were three: Evolution for the view of the

universe; Liberty for the guidance of human affairs; Justice for our actions toward others. And so we find his biology, his sociology, and his ethics an elaboration of these three principles. It would be interesting to follow these out in all his various ramifications. I should like to speak this morning of Spencer as a sociologist, the science of which he is still recognized as the father, and not only as the father, but fundamentally the master. I should like to speak of his work on Education, which ought to be in the hands of all parents and teachers in this land, for it constitutes the basis of all our modern views on education. I should like to speak of Spencer, the pacifist. There exists in the English language no more trenchant indictment of war and militarism than is contained in his "Study of Sociology." If Europe had followed Spencer during the last quarter of a century, we might have been spared all the horror of the last decade. But I must confine the remainder of my time to the contribution which Spencer made to the establishment of the doctrine of evolution, principally as found in his "Synthetic Philosophy," which of course is the supreme accomplishment of his career.

III

Before doing this, I should like to say that it is not possible for me in this short time to enter into a criticism of Spencer's theories. In all the facts that have been unearthed since his day, we find that many of his conclusions were unjustified

and that his dogmatism in many cases unfortunate; but all this cannot, or should not, detract from the supreme contribution which he made to humanity in synthesizing all the knowledge of the world according to the fundamental principle of evolution; and in bringing philosophy down out of the skies and building it upon the bed-rock of facts. Heretofore, philosophy had been something entirely apart from science; it continued its speculations with little regard for the methods or results of science. But Herbert Spencer took the results of scientific investigation as the basis for his philosophical speculation and applied the scientific method to all his theorizing. With his instinctive genius for generalization, he took the knowledge then available and wove it into an ordered plan, carving out a principle, which immediately introduced order and method, where previously there had been nothing but a hopeless jumble. And regardless of all the errors he may have made, this is a service which men, devoted to knowledge, will never forget.

Now I should like to fix very definitely in your minds Spencer's place in the establishment of the doctrine of evolution. Many people think that Darwin discovered the principle and that Spencer was merely an adapter and enlarger and popularizer of the doctrine. But Spencer was in no sense a follower of Darwin. He worked his way independently, from a different starting point and through an entirely different course of investigation, to a conception of evolution as a universal process underlying all phenomena, long before Darwin had

made public his special study of the operation of one of the factors of evolution in the limited sphere of the organic world. The "Origin of Species," you will remember, was published in 1859; but as early as 1852, Spencer's first paper on evolution appeared, "The Development Hypothesis," and his system of philosophy, which was essentially based on this doctrine, was first drafted in 1857. And so Spencer's position as one of the originators of evolution, independent of all the others, cannot be denied. Of course, like many of these early writers, he made a number of mistakes, but his general idea was essentially sound. Moreover, he was the first to extend the theory to a general conception of the universe, and to retrace not only in living organisms, but in everything, the process of evolution. And this great generalization, combined with his insistence, was a powerful factor in the success of the evolutionary point of view. It helped mightily to create a new scientific and philosophic atmosphere, and to place in the hands of men the key to the riddle of existence.

And all this is worked out in that stupendous undertaking, "The System of Synthetic Philosophy" including "The First Principles" which dealt with the cosmic evolution; "The Principles of Biology" or the evolution of life; "The Principles of Psychology" or the evolution of mind; "The Principles of Sociology" or the evolution of society; and "The Principles of Ethics" or the evolution of morals. Here Spencer takes this whole universe and everything it contains and shows it all to be

he product of one unifying principle—evolution He takes all these different sciences and builds into one vast structure what hitherto had been regarded as separate buildings. Other philosophies have attempted the same thing with regard to special departments of the universe — some its cosmogony, some its organic kingdoms, some its politics, some its religion and morals — but the grandeur of this philosophy is that it shows how one set of principles runs through the product of everything, from the making of a weed to the making of a world, and from the lowest realm of matter to the loftiest reach of human personality.

And now let me see if I can in a few words give you the gist of these different sections of the philosophy. The foundations of his doctrine are naturally contained in the wonderful introductory volume bearing the title, "First Principles," which contains the framework of the whole system. The first part, entitled "The Unknowable," deals briefly with the universe as it is and shows that all phenomena are but manifestations of an unknown power, which transcends not only human knowledge, but human conception; that is, the underlying reality of the universe is not only unknown, but forever unknowable. The second and far more interesting part of "First Principles" deals with the knowable and lays down those universal laws which control the existence of all beings. It begins by defining philosophy as unified knowledge and then goes on to seek for such knowledge in our ideas of space, time, matter, motion and force.

After dealing with those commonly recognized principles of science like the indestructibility of matter, the continuity of motion and the persistence of force as analytical truths, he builds up his famous definition of evolution, and with this binds them all together into a unified whole; and then sums up in this one vast and all embracing law all the actions of all things from atoms to systems, from nebulae to planets, from the nests of ants to the political organizations of human communities.

The next two volumes are devoted to "The Principles of Biology," which give in a masterly manner, a reconstruction of the course of plant and animal evolution, and finally enunciate that definition of life, which has become the basis of all modern biological study, as the continuous adjustment of internal to external relations, and the consequent emphasis on the need of adapting the organism to its environment. He begins by inquiring wherein living organisms differ essentially from inorganic matter; and he finds the answer in their peculiar power of altering their shape or inner arrangement in various ways in accordance with alterations in surrounding nature. Hence, he gives his celebrated definition of life as "correspondence with the environment" or more formally as "the continuous adjustment of inner relations to outer relations." Hardly less interesting is the latter part of the work in which he deals with evolution in the concrete and contrasts the theory of evolution with the theory of special creation, and shows how the latter is impossible and

unthinkable, while the former is supported by a vast mass of evidence on every hand.

From physical life, Mr. Spencer proceeds next to mental life, and in the two volumes of the "Principles of Psychology" subjects the science of mind to the same thorough-going evolutionary treatment as he had applied to the science of form and structure. Here he builds up the human intelligence by slow degrees from the simplest and vaguest elements of consciousness, showing how its development goes step by step with that of its co-related physical organ, the nervous system. His first volume consists of this direct evolutionary reconstruction of mental manifestations and their mode of origin; the second consists of a searching analysis of mental operations viewed in themselves, which is perhaps the most original work Mr. Spencer did, and likewise the most difficult for the ordinary reader to follow.

Next comes his "Principles of Sociology," which attempts for the first time to lay down the framework of a science of man in all spheres of his social activity — to deal with his religions, his governmental agencies, his languages, his arts, his industry; and to show that all of them have grown into their present forms by this same process of evolution. One of the most interesting sections to the general reader is that which deals with the origin of religion, in which he traces the belief in gods and other supernatural beings to what he regards as the erroneous psychology of primitive man, which led him to imagine the existence within himself of a soul or spirit distinct

from the body, and capable of a separate and immaterial existence. Other important parts deal with political institutions and with the rise and progress and varieties of the family. This last subject is of the utmost value today and has nowhere else been treated with so wide a knowledge of facts and so unprejudiced a point of view. It is in his sociology too that he works out the idea of society as an organism, in which the individuals bear somewhat the same relation to the whole, as the cells in the human body bear to the whole body — an idea which originated with him and which has been the basis of much of our modern social theory.

"The Principles of Ethics" round out this great life work and give the evolutionary basis of moral action. Mr. Spencer shows that moral laws are not the arbitrary commands of a Supreme Being, but rather the result of men's experience in living with one another, and finds their natural basis in the social necessities of human life. It was the first effort to change from an intuitional to an evolutionary basis in morality, and seek the real sanction for morality in man's social experience.

And thus did Herbert Spencer synthesize for us the whole realm of knowledge. There have been many analytical philosophies, but there is only one synthetic philosophy. Philosopher after philosopher has disclosed to men some newly discovered principle, has specialized along some one particular line; and then came the master mind who by the force of unexampled intellect was able to unfold the sum total of human knowledge and

make his generalizations, revealing to his fellowmen the all controlling principle. Whereas there have been men who have discovered in a special field more than he did in that given direction, to him belongs the distinction of having grasped the laws controlling the principles they discovered and of placing them in right relations to certain central facts which he established. They covered one area of thought; he covered the whole world of thought. They made discoveries along one line; but he made the points of contact whereby the unity of the whole was recognized. There are two kinds of philosophers — one kind are the special problem workers, the experts, who know nearly everything about some one thing; and then there are the system-builders, whose command of the entire field of knowledge enables them to collect the thousand scattered fragments of truth into a reasoned whole. The former may be likened to a stream which cuts a channel through the granite, not so much by its size as by its persistence; but Herbert Spencer was more like the Atlantic ocean, which hugs a hundred shores and keeps afloat upon its bosom the commerce of the mind.

That he was hated and abused was one of the best evidences of his greatness. Very few people abuse the nobodies. That this genius should have been made the special butt of hatred was a compliment considering the kind of work in which he was engaged. Theologians feared him — why? Because as a very clever American writer once said, "they are like a man who has a paste diamond and who stands in fear of the lapidary."

None knows better than the man with his paste gem that the expert can disclose his false claims. And theologians realized that before the searching mind of Herbert Spencer, their doctrines could not hold together. They knew that he was a man without passion and without prejudice, one who brought only the power of calm reason, of an intellect which searched as with a microscope, to bear upon the principles he investigated; and they also knew that their theology would not stand the test of such an examination. They knew that he would undermine the scaffolding of their ignorant superstitions by delving beneath appearances to the reality of the universe.

And before I close, I should like to acknowledge my debt to Herbert Spencer — not only to what he wrote, but to what he was. Last week in announcing this subject, I said that fundamentally Spencer's philosophy formed the basis of most of my thinking. During the week I received a letter from one with unusual discrimination in such matters, who said, "I think you exaggerate your debt to Spencer. Great undoubtedly it is, but there were things in the sermon this morning which you did not get from Spencer." This remark suggests that I explain what I mean by my debt to Spencer. Of course, I do not mean that I am a blind follower of the doctrines which he taught. If it had been my purpose this morning, I could have found enough fault with the teachings of Spencer to suggest to you that I hold him in slight regard. And yet I consider myself a follower of Herbert Spencer. And the reason

is not far to seek. Spencer's philosophy is animated from beginning to end by a contempt of authority, by a tendency to emphasize the importance of thinking for one's self; which is in complete opposition to the spirit of discipleship.

Spencer himself never was or could have been a disciple of any one; his whole constitution rebelled against it; and it may be said that the same trait characterizes those who are most imbued with his spirit. They, too, are more likely to criticize than to follow a master. Spencer teaches us to follow reason always and authority never, and so by its very nature his philosophy precludes discipleship. And those who become blind followers of Spencer have missed the true spirit in which he wrote. If Spencer were living today, there would be no severer critic of his own works than he himself, and only as we are prepared to pass his doctrines through the fire of uncompromising analysis, do we become true disciples of Herbert Spencer and recognize him as one of the greatest and most powerful minds the world has ever had. We can then see that in the whole history of the world there never has been a philosopher more deeply imbued with the spirit of liberty and of reason. And while we may believe that there is still no finer introduction to the sciences of biology, of psychology, of sociology and of ethics than is to be found in Spencer's monumental works; while we may believe that his original theories are well founded, yet we esteem him today, not so much because

of his words as because of his memorable battles for liberty and for reason, and because he gave us a point of view from which to see and at least partially understand the universe.

V.

THOMAS HENRY HUXLEY

In our study of the "Fathers of Evolution" we come next to Thomas Henry Huxley, who among all the great scientists and thinkers of the last century, to my mind, stands first in nobility of character and in majesty of thought; and who perhaps did more than any one else in this period to establish the authority of the scientific method which today we recognize as the only valid method for the discovery of truth and the advance of knowledge. Perhaps he did more than any other to establish the truth of evolution, to which he devoted his life. Charles Darwin was the man who gathered the evidence for the theory of development and who formulated the doctrine of natural selection to explain the facts which he found; Herbert Spencer was the man who extended the theory to the whole realm of existence; but Thomas Henry Huxley was the man who won for this theory the sanction of the scientific world as well as the acceptance of the majority of common people. Huxley was known in his day as Darwin's bull-dog; today he would probably be

called Darwin's loud speaker. In any case, he was the man who put evolution on the map, and it was extremely fortunate that the same generation produced a Huxley that gave the world a Darwin. Darwin was extremely modest and reticent, and maintained a dignified silence in the presence of a frantic and unscrupulous opposition to his views. An organized attempt was made to stifle the evolution theory at its inception. It was, of course, a revolutionary principle, and so was naturally compelled to face an unprepared and prejudiced public, not only among theologians and ecclesiastics, but among scientists and philosophers as well.

But at this juncture, Huxley stepped into the breach, threw down the gauntlet, and during the strenuous period that followed, became the recognized champion of freedom for scientific thought and utterance. He was already favorably known to Darwin, who had declared that there were three men in Britain on whose verdict he relied—Lyell, Hooker and Huxley. If he could convince them, he could afford to wait for the rest. The last of the three, a brilliant young scientist still in his thirties, who by the extent and accuracy of his knowledge and the soundness of his scientific judgment, had become equally formidable as an opponent or an apologist. After rapidly reviewing the "Origin of Species," he wrote to Darwin: "As for your doctrine, I am prepared to go to the stake, if necessary. . . . . I trust that you will not allow yourself to be in any way disgusted or annoyed by the considerable abuse and misrepre-

sentation which, unless I greatly mistake, is in store for you. . . . . Some of your friends at any rate are endowed with an amount of combativeness which, (though you have often and justly rebuked it), may stand you in good stead. I am sharpening up my claws and beak in readiness." There followed twenty years of such battle as has never been seen at any other time in the arena of human thought. And in spite of his many other contributions to the world both as a man and as a scholar, he is remembered today chiefly as the man whose persistent clarity and eloquence completed the work of Darwin by gaining acceptance for the theory of evolution.

I

The writer of this militant letter was born at Ealing, a suburb of London, on May 4, 1825, where his father was assistant master in a preparatory school. Of his ancestry no more is known than in the case of most middle-class families. From his father, he thought he derived little except a quick temper and an artistic faculty which greatly helped in his study of science. "Mentally and physically," he wrote, "I am a piece of my mother." He attributed to her the source of his genius and was deeply attached to her, though she died while he was yet a boy. He was the seventh and youngest surviving child. One of the striking facts in his life, as in the lives of the other men we have treated thus far is that in a formal sense he received no education. He writes, "I had two

years of a pandemonium of school and after that neither help nor sympathy in any intellectual direction till I reached manhood"; but the academic loss was compensated for by his zeal for literature and his indomitable will. At twelve, he was sitting up in bed to read Hutton's Geology, followed by Lyell's Principles, and a little later he studied Hamilton's Logic. The author, however, who most profoundly influenced his youth and inspired his high ideals of duty and passion for truth, his abhorrence of unreality and contempt for sham, was Thomas Carlyle. From him, he tells us, he learned the purpose and discipline of life. Incidentally he gained from him the passion to study the masters of philosophy, science and history in their own speech; and so unaided, he made himself master of German, French and Italian. As a boy, his great desire was to be a mechanical engineer; but circumstances made this impossible and at the age of seventeen, he began the study of medicine in Charing Cross Hospital, and later took his degree at the University of London with honors in anatomy and physiology. His taste for engineering did not leave him, only it was transferred from nature to the living body. He cared nothing about medicine as the art of healing; he was interested only in physiology, and physiology conceived, to use his phrase, "as the mechanical engineering of living machines."

Upon graduation, he applied for a commission in the navy and was appointed assistant surgeon to the frigate Rattlesnake, which was ordered on a surveying voyage in the southern seas, and on

which Huxley made a voyage of scientific observation and research; and so for more than four years, he studied in nature's great biological laboratory, as Darwin and Wallace had done before him, spending most of his time on the coasts of Australia and New Guinea, where there is a wealth of material. During this time, he sent home many communications on the results of his work with, as he said, the same effect as that obtained by Noah when he sent the raven out of the ark, but finally his important paper, "On the Anatomy and Affinities of the Family of Medusa," won him recognition; and he was elected a member of the Royal Society and granted the Royal Medal; and thus at the age of twenty-six, with absolutely no aid from any one, he had placed himself in the front rank of English scientists, principally because of the spirit as voiced in a letter at this time—"I don't know and I don't care whether I shall ever be what is called a great man; but whatever mark I leave in the world shall be clear and distinct and free from the abominable blur of cant, humbug, and self-seeking which surrounds everything in this present world." It was during this period that he met the young lady who after a long and protracted courtship became his wife, with whom he lived in perfect sympathy and charming intercourse the rest of his days. She was his first care and his last thought, and their entire married life was a notable example of mutual helpfulness and service.

For some time after his return to England,

repeated repulses discouraged him, but the year 1854 brought him some of the more substantial tokens of success. He was then offered the post of Palaeontology and lecturer on Natural History in the Royal school of Mines. He was divided between his allegiance to physiology and his desire to make a living; and frankly told the people when he accepted the position that he would give it up as soon as he could get a chair in physiology, because he was in no sense interested in fossils. But in spite of this, he held the office for thirty-one years; and of his scientific work, a large part is palaeontological. Indeed, he took the whole field of zoology for his province; and it is the verdict of Haeckel that he was the foremost zoologist of England. This is not the place to describe his volumes or even to mention his celebrated memoirs, which made contributions of tremendous significance to natural science. After the publication of the "Origin of Species," his investigations were largely guided by the Darwinian theory, of which his results formed a striking and substantial verification. Previous to this, he had not believed in evolution, stating that the evidence was insufficient and that no theory for the causes of transmutation had been offered which adequately explained the phenomena; but Darwin's book gave him both convincing evidence and reasonable explanation of the cause. Not only did he accept it, but he immediately pushed Darwin's theory to its logical conclusion in extending the process of evolution to man and including him in a universal order of development whose continu-

ity is unbroken. The "Origin of Species," you must remember, did not include man, and Huxley's "Man's Place in Nature" preceded Darwin's "Descent of Man" by eight years; in fact, Darwin admits that it was Huxley's work which gave him courage to make the final deduction.

Huxley's growing fame procured him membership and office in many learned institutions and scientific associations, and in 1883 he was crowned with the highest official distinction to which a British scientist can aspire—the presidency of the Royal Society. In 1885, he resigned his professorship and all his other official posts and soon afterwards moved from London to Eastbourne. But though he had well earned the ease and quiet of retirement, it is the last decade of his life which is notably marked by those incursions into politics and ethics and especially theology which made Huxley's name one of the best known in current literature. These incursions were stoutly resisted, but such was the advantage of his controversial position and his skill in attack and defense that he was seldom worsted and never vanquished, though he had among his adversaries some of the subtlest disputants in the English-speaking world. And after forty years of indefatigable toil, he spent his remaining days at Eastbourne, enjoying the love and confidence of friends and foes, who however much they agreed with or differed from him, gave him their united and hearty esteem. He died June 29, 1895, having just completed man's appointed three score years and ten, and his attitude toward

this event is best summed up in those five significant lines on his grave-stone, written by his wife and placed there at his own request:

> "And if there be no meeting past the grave,
> If all is darkness, silence, yet 'tis rest.
> Be not afraid, ye weeping hearts that weep,
> For God still giveth his beloved sleep.
> And if an endless sleep he wills—so best."

II

I am tempted to pause here and speak at length of Huxley himself as a man, because there is no one for whom I have a greater admiration; but I must pass on to speak of the work which he did as a result of his long and consecrated life. And Huxley himself would like me to do this, for one of his most attractive qualities was humility, his entire thoughtlessness of himself and his personal interests. He is one of the few noble souls who sought and proclaimed the truth, utterly oblivious of what the consequences to himself might be. Regarding the purpose of his life, he once said, "My paramount duty is to smite all humbugs; to give a nobler tone to science; to set an example of abstinence from petty personal controversies; tolerate everything but lying; to be indifferent as to whether work is recognized as mine or not, so long as it is done." And so to get the work done, without regard to name or fame or fortune —this was his supreme purpose; and I believe that today, in this great crisis of human thought, in the terrible reversion to ignorance and superstition which we see about us on every hand, if

Huxley could speak, he would say: Spend no time in eulogizing my name, but pay tribute to me by continuing my work; "go ye forth into the world and preach the gospel—the gospel of evolution."

And indeed Huxley stands in no need of eulogy; his work is a living testimony of the man and the spirit which informed it. Those who knew him best loved him most; and none came into touch with his eager, sympathetic, breezy and altogether beautiful nature without receiving an impulse to higher aims, just as none can read him today without a searching of the mind as to the real purpose of life. Of spotless integrity in every relation, and single-minded in every purpose, he was one who "never turned his back, but marched breast forward," unswayed by motives of worldly prudence, undeterred by authority with no warrant for its claims, governed by a morality touched with emotion, and guided by reason within limits which none have defined so well, he remains alike an example and an inspiration to all men for all time—a man, whom Edward Clodd says, "It was well worth being born to have known."

III

When we turn to his work, we find it naturally falls into three divisions—his contributions to science; his contributions to philosophy, including education, ethics and religion; and his work as a protagonist of evolution, including his efforts as a popularizer of knowledge and a controversialist.

When I speak of Huxley's contribution to science, I have no intention of enumerating the great contributions which he made and the tremendous amount of knowledge which he brought to the realm of the distinct sciences with which he was associated. I wish rather to notice the service he did for science as a whole in forcing the people to recognize as authoritative the truly scientific method, that of following truth to its utmost bounds even though it means sacrifice of all the consecrated wisdom of the ages; for this was his great contribution—his absolute, uncompromising insistence upon the values of truth. Before his time, the progress of knowledge had been greatly impeded by the principle that there were kinds of knowledge which were dangerous, and that the first question to be asked of the teacher of a new idea was not, "Can you prove it by means of facts" but rather, "What will its effect be upon the accepted systems of theology and ethics?" Even Sir Isaac Newton felt constrained to make his most abstruse mathematical discoveries harmonize so far as possible with the system of Christian theology, and the whole general tendency then was to test knowledge by authority and not authority by knowledge. Now, of course, the theory of evolution was in such contradiction to the whole theory of Christian doctrine that it was looked upon as an exceedingly dangerous thing, and if its acceptance was ever to be gained, it was necessary to have a showdown on this problem of the relation of truth to authority.

Should knowledge be considered as the means whereby people were led to believe the things which it was good for them to believe, or should truth be made a deity to be worshipped without question, even though we do not know whether her face be fair or foul? This was a decision not easy for him to make, but in face of all the opposition, he bravely declared, "We must make our theories conform to facts and not try to make facts harmonize with our theories," a notion which he expanded in these words, "Sit down before fact as a little child; be prepared to give up every preconceived notion; follow humbly wherever and to whatever abysses nature leads, or you shall learn nothing." And not only that, but he went a step farther and said in regard to our systems of thought, "Give unqualified assent to no propositions but those the truth of which is so clear and distinct that they cannot be doubted." This for Huxley was the first great commandment of science. It was the first time a popular teacher had clearly formulated that modern creed which has as its fundamental tenet the belief that there is no principle so firmly established by tradition or authority or revelation that it may not need to be modified by knowledge; and it was the first time that any one had boldly affirmed that if nature held fatal secrets, we had best know them.

For Huxley was not merely a seeker of truth; he was her knight and sworn champion, her defender and her advocate. He was a kind of scientific missionary who in his time did what Robinson says is so necessary in our time—the human-

izing of knowledge. While other scientists were delving in their laboratories, Huxley was out in the open field preparing the way for the acceptance of their results. Huxley liked research too, but he cared more for the general acceptance of the results achieved by scientists, and his chief delight was in compelling the public to assent to them. It is this missionary spirit which distinguished Huxley from all the other scientists. He was the great apostle of the modern gospel of science, and he proclaimed this evangel with all the earnestness of the preacher. No evangelist has ever heard the call to preach the gospel of Jesus Christ more distinctly than Huxley heard the call to preach the gospel of science; and no evangelist ever entered upon his work with a more exalted sense of duty than did Huxley as he went up and down the land with unflinching courage, denouncing hypocrisy and sham, exalting truth and right, and winning converts to the principle of salvation through knowledge rather than salvation through faith.

When we turn to his work as a philosopher, we find him a great force in education, in ethics, and in religion. His labors in behalf of public education were second only to his achievements as an eminent scientist, and his definition of a liberal education has become a classic: "That man has had a liberal education who has been so trained in his youth that his body is the ready servant of his will, and does with ease and pleasure all the work that as a mechanism it is capable of; whose intellect is a clear, cold logic-engine,

with all its parts of equal strength, and in smooth working order, ready like a steam engine to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and of the laws of her operations; one, who no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty whether of nature or of art, to hate all vileness and to respect others as himself. such a one and no other I conceive has a liberal education; for he is as completely as a man can be in harmony with nature. He will make the best of her and she of him. They will get on together rarely; she as his ever beneficent mother; he as her mouthpiece, her conscious self, her minister and interpreter." His faith in this kind of education never wavered for an instant, and he extended its possibilities to all alike, tradesmen, artisans and aristocrats. Much of his time was spent in carrying the great wealth of his knowledge to the common people in popular form that they might fulfil his ideal of education.

Ethics occupy almost as important a sphere in Huxley's teaching as science and education, though his speculations on ethical problems are perhaps the least satisfactory of all his writings. To go into his philosophical theory of right and wrong would lead me far afield this morning, so I want merely to testify to his noble conception of character and his unswerving devotion to what

he believed to be right. He had a much higher regard for men of character than for men of ability. The former he said are very rare, though the latter are common enough. And he always insisted that whatever estimate he made of him should be based on the principles which motivated his life rather than upon his ability or his accomplishments.

When we study his philosophy as applied to religion, we find him the father of a well-established attitude of mind, known as agnosticism. Not that he was the founder of what has come to be known as the agnostic philosophy, but in supplying the name and setting forth the principles, he gave articulation to what was before very hazy. Agnosticism, as you know, means "without knowledge," and this term was invented by Huxley to describe the philosophical and religious attitude of those who hold that we can have scientific or real knowledge only of phenomena, and that so far as what may lie beyond phenomena is concerned—God, immortality—there is no evidence which entitles us either to deny or affirm anything. This attitude is as old as the human intellect; it has been the attitude of many of the world's greatest scientists, philosophers, historians, poets and humanitarians; but the expressions "agnostic" and "agnosticism" were applied by Huxley to sum up this attitude as embodied in his own mind. He invented the term, you will remember, in order that he too might have a designation. He was a member of the Metaphysical Society, a discussion club composed

of all those great mid-Victorian minds, each of which had a name—he was a churchman, a materialist, an atheist, a positivist, or some kind of an "ist"; so Huxley came one evening parading his new name of "agnostic." The term was considered extremely pertinent; with extraordinary rapidity, it penetrated the English language and has become a well-known type of philosophy.

Since Huxley is the father of agnosticism, it might be well to understand just what he meant by it. In one place, he says, "Agnosticism is not a creed, but a method, the ethics of which lies in a rigorous application of a single principle which positively may be expressed: in matters of intellect, follow your reason as far as it will take you, without regard to any other consideration. And negatively: in matters of the intellect, do not pretend that conclusions are certain which are not demonstrated or demonstrable. That I take to be the agnostic faith, which if a man keep whole and undefiled, he shall not be ashamed to look the universe in the face, whatever the future may have in store for him." In another passage that has become classic, he defines the agnostic principle as he holds it. The principle is "that it is wrong for a man to say that he is certain of the objective truth of any proposition unless he can produce evidence which logically justifies that certainty." Having laid down that proposition, he adds: "This is what agnosticism asserts; and in my opinion, it is all that is essential to agnosticism. That which agnostics deny and repudiate as immoral is the contrary doctrine that there are

propositions which men ought to believe without satisfactory evidence."

I wish you to note then that the fundamental principle of Huxley's agnosticism was ethical, not intellectual. It was an assertion not that a certain doctrine was true, but that a certain practise was immoral—the practise of saying that one is certain of the objective truth of any proposition unless one can produce evidence which logically justifies that certainty. And the reason he believed it to be wrong was because of his passionate yearning for truth. The moment one accepted as true any particular conception that could not be demonstrated, it stood in the way of finding the actual truth, for he would then stop seeking after knowledge in that particular realm. And this principle made Huxley's religion an immensely practical thing—based upon the things which we do know in this world. He would say that we do know something of humanity, of its history, of the conditions of its welfare. We have learned by experience the things that help and hurt men, the things that make or mar individuals, that build up and destroy communities. There is no uncertainty about these things, because we do not know definitely about God and immortality. Therefore, let us base our conduct upon the facts of human life, as we have learned them through experience and observation.

The third great thing which Huxley did was as a progandist for the theory of evolution, and to him more than any one else, is it due that the theory of evolution is today accepted by all intel-

ligent people, and it is chiefly for this that he is remembered today. As I suggested a moment ago, Huxley was convinced of the truth of evolution immediately upon reading the "Origin of Species," and within a few weeks, he wrote Darwin that he would go to the stake for it if necessary and proposed to fight for it the rest of his days; and this he did for twenty long years, bringing to bear upon it his indomitable courage, his invulnerable powers of debate, and his unlimited resources of wit and sarcasm. I sometimes wonder what would have happened to Darwin's work if Huxley had not lived. It no doubt would have won its way in time, but it would never have captured the public mind as it did within a score of years. Darwin himself was no fighter—his field of operation was the laboratory and study, not the arena of public discussion. But Huxley was a fighter from the top of his head to the soles of his feet, and he was never so happy as when engaged in a combat of ideas. His zest in the pursuit of knowledge was never so keen as when the game led across the enemy's preserve. And this was no doubt true because of his unusual success in this field. He was the most formidable controversialist in the whole world during the period of his life, and for two decades he did battle for the cause of evolution on three fronts.

First of all, he met the opposition of science itself. You know there is just as much dogmatism among scientists as among other people. They are almost as loathe to accept a new theory, especially one which happens to contradict their

favorite ideas, as a priest of religion. And science was unprepared for Darwin's revelations; they were too radically different. They meant the entire reconstruction of their whole system of science and this they were not ready to do. Only three scientists in England—Hooker, Lyell and Lubbock—and only one in America—Asa Gray—confessed themselves converted to the theory. But with addresses and scientific papers innumerable, Huxley bombarded the phalanx of opposition and did more than any other man, except Darwin himself, to change the mind of the scientific world. And today science stands absolutely unanimous in its acceptance of evolution; as one of its most eminent exponents said, "Evolution is regarded to be as proved a part of biology as gravitation is in the science of physics."

The church, of course, remained unconvinced during his lifetime, but it was effectually silenced by Huxley's terrific assaults, of which the controversies with Gladstone and the reply to Bishop Wilberforce are the most famous. In the first of these, we get an excellent illustration of Huxley's method of debate which was to impale his antagonist between the horns of an either-or. He had no sympathy whatever with one who compromised and quibbled. He held only contempt for a middle-of-the-road man. He reduced everything to a clear case of either-or. The means of gaining knowledge was either through science or through revelation; things as they exist today are the result of either evolution or creation; and concerning the origin of man it was a case of either

ape or Adam; and thus he drove the Anglican modernists of that time either back into the orthodox fold or lead them out into the acceptance of the evolutionary theory. And in the reply to Bishop Wilberforce, we have a splendid illustration of the way in which he turned his incomparable wit and sarcasm to good advantage. In a meeting of the British Association, the American, John W. Draper, presented a paper on "The Intellectual Development of Europe with reference to the views of Mr. Darwin and others." In the discussion which followed, Dr. Wilferforce waxed witty and warm in his denunciation of the scientist's expressions. Huxley waited, imperturbable even when the bishop fired his last barrage, intended to be loaded with acid wit, "whether it was by his grandfather's or his grandmother's side that he was related to an ape?" Huxley rose and replied quietly in this wise: "I asserted and I repeat that a man would have no reason to be ashamed of having an ape for his grandfather. If there were an ancestor whom I should feel shame in recalling, it would be a man of restless and versatile intellect who, not content with an equivocal success in his own sphere of activity, plunges into scientific questions with which he has no real acquaintance, only to obscure them by an aimless rhetoric and distract the attention of his hearers from the real point at issue by eloquent digressions and skilled appeals to religious prejudices."

In the third place, Huxley went to the people and he gave them instruction in modern science.

His lectures to workingmen, series of which he gave every two years, brought the meaning of evolution to those who could not otherwise have had any knowledge of the subject. His lectures to workingmen, for instance, on "our knowledge of the causes of the phenomena of organic nature" are models of popular exposition. He never, as so many scientists do, despised the common people. He knew that they must understand and believe, if evolution was to become a part of the accepted knowledge of the world. And so he became one of the greatest teachers of all times, because be brought, as no other man has, to the public mind the knowledge which was being found in the laboratories. He did what Robinson says above all else must be done today if we would save ourselves—he humanized knowledge by taking it from the study and translating it into the language of the people in their very presence.

And here is the reason for the revolt against the theory of evolution today. As I said a moment ago, evolution is an established historical fact in the realm of science. No scientist of any repute anywhere doubts or disputes its reality; and yet many churches are seeking to force out their evolutionists as heretics; state legislatures are forbidding the teaching of evolution in schools and colleges; and the public generally is in sad confusion and is fast coming to repudiate the doctrine. This seems incredible to one who has been brought up on the theory and whose entire knowledge and philosophy is based upon it as an established fact, but it can easily be understood.

It means that the Christian church is as always faithless to the truth, and ready to take advantage of the ignorance of the people in the interest of its superstition; and the few men within its ranks who know better are indifferent and cowardly. They see with perfect clearness that the whole structure of Christian theology is doomed by evolution and so they have entered upon a campaign for its destruction, simply because they are in no wise interested in truth, but only in the preservation of their untrue and immoral theology. Huxley's contempt for theologians is richly justified today.

On the other hand, we have the fault of science itself—the failure to keep the public mind informed of what it has accomplished. Not only are the scientists not doing this, but they hold in contempt the occasional one who does. Prof. Shapely of Harvard University, perhaps the most eminent authority in astronomy today, gives an occasional popular lecture on his branch of science. I once heard him hold a large audience in tense silence while he spoke for almost two hours on "A Roomier Universe"; and after the lecture, he told me, when I spoke to him of the wonderful thing he was doing, that he had been sharply criticized by other scientists for popularizing his subject; and I have heard a similar criticism of Dr. Slosson, who has done the little that has been done in this line. And so if the present generation does not know Darwin; it is because the scientists have deserted the public platform and hidden themselves away in their

laboratories. What biologist today is giving lectures to workingmen on organic nature? The common people are in need of instruction; and what we need today more than anything else in all the world is another Thomas Henry Huxley, who will carry to the people in simple phrase the knowledge which is confined to the academic few. When Darwin was dying, he wrote, "I wish to God there were more in the world like you." We might well say "Amen" to that prayer. Each generation needs a Huxley.

When finally we come to appraise the place of Huxley in the history of human thought, I think we will love him most for his attitude toward truth. Here was an honest man, who knew well what he knew, who professed to know nothing which he did not know, who hated every kind of cant, who detested all thinking adulterated by bias of profession or of class, who loved precision and distinctness, and who would have every man know what he knew to be true, and what he knew to be false, and what he neither knew to be true or false. He was a scourge not only to intellectual laziness and intellectual haziness, but to all that practise of accommodation which is bred by authoritative creeds and ecclesiastical control, to which thousands of the clergy are given over, and which is the despair of all men who hold plain honesty, veracity and directness of thought and speech to be vital elements of human life. Not by the smartness of his controversial practise will he live long in the records of famous men; but by the intensity of his honesty, the splendour

of his courage and the virility of his passion for truth.

I love him most when he says, "Sit down before fact as a little child, be prepared to give up every preconceived notion, follow humbly wherever and to whatever abysses nature leads, or you shall learn nothing." This is the basis of all knowledge. That is, whenever we ask the question whether or not a certain thing is true, we are under obligation to believe as true not what we want to believe, but what we must believe. We find the truth only insofar as we come to the investigation of it with minds that are emptied of all previous conceptions, minds that are ready to accept the facts whatsoever those facts may be, and minds ready to follow those facts whithersoever they may lead. On the other hand, we miss the truth whenever we enter upon its search with minds filled with pre-conceived traditions, with minds that reject new facts as untrue just because they are new and refuse to follow those facts just because they lead in a direction we do not like to travel. How different the world would be if all the people were to make this principle of Huxley the guiding principle of their lives.

VI.

ERNST HAECKEL

Most people are unfamiliar with Haeckel's first name, because he is usually called Professor Haeckel. This is no doubt due to the fact that the German professor occupies a unique position in the life of Germany; indeed a peculiar distinction attaches to him the world over. Nowhere in the world is scholarship, especially scientific scholarship, honored as it is in Germany. The very title of "Professor" is replete with honor. In America, where the business man is the ideal type, the men who teach in our universities hate to be called "Professor" almost as much as I hate to be called "Reverend"; but in Germany it is a title which no man would resent, for the simple reason that there is no other group of men who command so much real respect as the professors. And of all the distinguished company of German professors and scientists none is better known the world over than Professor Haeckel of the University of Jena. He was the man who brought the theory of evolution into recognition in Germany, who made a number of very important contributions

to it, and who was its propagandist upon the continent for a number of years. What Huxley did to establish evolution in England, Haeckel did on the continent. Haeckel has been called the German Huxley, as Huxley was sometimes called the English Haeckel. I do not believe that, as I read this week, Darwin would never have been known had it not been for Haeckel; but I doubt if any one contributed more toward the establishment of the doctrine of evolution than did he. Not only was he a protagonist of evolution in the scientific world; but he made very valuable contributions to philosophic and religious thought. He was indeed a prophet and a mystic as well as a scientist, and formulated a new religious creed which he preached with all the fervor of an evangelist.

I think it was Goethe, Haeckel's favorite poet, who said that if you would know a man, you must know something of that man's environment; and so if you would know Haeckel, you must know something of Jena, the university in whose faculty he spent his life, for he is known in every quarter of the world as "the prophet of Jena." In central Germany, there exist three very great universities—Leipsig, Halle and Jena—within a circle of twenty miles radius. Even the remarkable development of Berlin University since that city became the capital never overshadowed the smaller universities; for curious as it seems to us Americans, students in Europe are not influenced in the choice of a university chiefly by its size, the splendor of its buildings, or even its athletic record. They consider the personality of the pro-

fessors the important thing; and if a professor moves from one university to another, his students are very likely to move with him. Jena, one of the smallest of the German universities, does not confess inferiority to its rivals, not even to Berlin. On the contrary, Haeckel, in his famous controversy with Virchow, apologized for his opponent's ignorance of biology on the ground that he could not be expected to keep up with the advance of the science among the luxuriant appliances and social duties of Berlin. In fact, Haeckel laid down a law in this respect, which he said was never contradicted; namely, "That the scientific work of an institution stands in inverse ratio to its size."

If this be true, then Jena is surely the ideal spot for the thinker. The university had in Haeckel's day about two thousand students and is located in a town of twenty-five thousand, whose whole life is absorbed in the university. I have never been to a place which seemed to be so permeated with the academic atmosphere. Most of the streets are called after famous German poets and scholars whose lives have in some way been associated with the town; and one can scarcely walk about this ancient city without feeling something of the fascination of the student's life. There has always been a remarkable freedom of instruction at Jena, even for Germany, which no doubt is due in part to the fact that the university is located in one of the minor states, remote from the great political centers, and derives its support from several sources. As Haeckel once put it:

"We have four masters and so we remain free." We realize that Haeckel had reason to be grateful for this freedom when we remember that he first championed the cause of evolution in 1862, only three years after the publication of the "Origin of Species," when even today professors are being dismissed from American universities for believing in evolution. And I am sure that a man with Haeckel's views on religion and his blunt way of expressing them, would find it difficult to retain his chair in most American universities. In Germany a man may hold almost any views and keep his position, especially in the smaller universities. It might be well to add that because of Haeckel's ardent championing of the cause of Darwin, he was strenuously attacked by the church; and a prominent theologian once begged the university to dismiss the heretic professor. The tension became very great and Haeckel offered to resign, but the head who had little sympathy with his theories said, "My dear Haeckel, you are still young and you will yet come to have more mature views of life. After all you will do less harm here than elsewhere, so you had better stay." But, while Haeckel did not change his views except to become more radical as he grew older, the university did not suffer by his presence. On the contrary, his fame as a scientist and a teacher drew students from all over the world and brought the university several large endowments.

I

I shall be very brief in relating the events of his career. Ernst Heinrich Phillip August Haeckel, to give his full baptismal name, was born in Potsdam, February 16, 1834. He had a double inheritance of talent, for both the Haeckels and the Sethes, his mother's family, have contributed prominent names to German history, especially in the field of law. But Ernst did not follow the family tradition and take up law. In his early years, he gave evidence of an ardent love of nature and an unmistakable bent for natural science, so as a compromise profession his father had him trained for a physician. He took the medical course and in obedience to his father's wishes, he consented to practise the profession for a year to see if he could make a success of it. During the year only three patients came to him, owing perhaps to the fact that in order to get time for his biological researches, he held his consultation hours from five to six o'clock in the morning. His father then abandoned the attempt to make a doctor out of him and let him go to Messina in 1858 to study marine animals. He straightway became engaged to his cousin, Anna Sethe, and as soon as he received his appointment at Jena, married her. Their happiness was brief, for two years later she died, leaving Haeckel, then thirty, so stricken that he felt he could not long survive the blow, so he plunged with feverish haste into the preparation of his "General Morphology" in order to leave to the world his science

and philosophy in systematic form. It was written and printed, more than twelve hundred pages in two thick volumes, in less than a year, during which time he lived like a hermit, working all day and half the night, getting scarcely three or four hours sleep out of the twenty-four. After three years, however, he married again, Agnes Huschke, the daughter of a Jena anatomist. They had three children, two daughters and a son.

It was in 1861 that he was appointed an instructor at Jena. In the following year, he was chosen professor of comparative anatomy in the same university; and in 1865, he was appointed to a chair in zoology which was especially established for his benefit. This last position he retained for forty-three years, in spite of repeated invitations to go to more important universities; and at Jena he spent his life, with the exception of the time devoted to traveling in search of zoological data. He retired from active service as teacher and investigator in 1909 at the age of seventy-five. He wrote several books after this, but they were mostly a repetition of what he had written before. He died during the summer of 1919 in his eighty-sixth year, and so there passed from the world that noble scholar, that stalwart apostle of reason, that ardent fighter for truth, whom William James in his Pragmatism cites as an arch representative of "tough-mindedness."

II

While his life was thus spent uneventfully in Jena, he was ever waging a war of ideas. For

Haeckel was the storm center of the cyclonic movements that swept over the world of thought during the last century. His name was a battle cry in the scientific wars of the last generation and perhaps even more so in the religious world, for as I intimated before he was a peculiarly religious man and sought to formulate a religion in harmony with his scientific conclusions. In his early years, he was an ardent champion of Christianity. He tells us, "I defended the Christian belief in my twenty-first year in lively discussions with my free-thinking friends, although the study of human anatomy and physiology and the comparison of man's frame with other animals had already enfeebled my faith. I did not entirely abandon it after bitter struggles, until my medical studies were completed, and I began to practise. I then came to understand Faust's saying, 'The whole sorrow of humanity oppresses me.' I found no more of the infinite benevolence of a loving father in the hard school of life than I could see of a 'wise providence' in the struggle for existence."

Nowadays when evolution is so generally accepted, when it is preached in the pulpit as well as taught in the school, it is hard for us to realize the scorn that greeted the theory when first announced. We who find the whole of our education and life based upon the evolutionary doctrine can hardly put ourselves in the position of those who fifty years ago believed that this doctrine meant intellectual confusion and moral chaos. So we can scarcely appreciate the courage of the young

Haeckel in supporting Darwin at a time when his theory was regarded as an absurdity, not only by the theologians, but by most of the leading authorities in every branch of science. But we may picture him on that memorable Sunday evening, described by his principal biographer, of September 19, 1863, as he rose to give the opening address of the scientific congress at Stettin—a tall handsome young man, blonde-bearded, bright-eyed, sun-browned, hard-working, athletic (for he had just won a crown at the Leipsig festival for a record-breaking jump of twenty feet.) It was certainly presumptuous in a zoologist of only twenty-nine years who had just secured an under-position in the university circle so to attack the conventions of his elders and masters there assembled. And Haeckel was no halfway man. As soon as he espoused Darwinism—which was barely a month after he laid his eyes on the "Origin of Species"—he drew from it conclusions that Darwin himself hesitated to suggest: on the one hand, that life originated from inorganic matter; on the other, that the human race originated from lower animals. He at once drew up a pedigree of mankind. Here is a passage from the very beginning of his famous Stettin speech: "As regards man himself, if we are consistent, we must recognize his immediate ancestors in the ape-like mammals; earlier still in kangaroo-like marsupials; beyond these in lizard-like reptiles; and finally at still earlier stages in lowly organized fishes." And this remember was eight years before Darwin published his "Descent of Man."

It may be said that Haeckel spent the rest of his life, so far as his scientific research was concerned, in filling in the outline which he had sketched at the Stettin congress in 1863. For however detailed or apparently far-removed was the work in which he was later engaged, he never afterwards lost sight of the general plan of life evolution. In 1866 he gave his general view of evolution as well as developed the fundamental principles of his Monistic philosophy in two large volumes, entitled, "General Morphology of Organisms"; and while Huxley called this a suggestive attempt to work out the practical application of evolution to its final results, and said that it would stand as a landmark in the history of biological doctrine, it gained very few readers outside of scientific circles and very little acceptance there; so Haeckel re-wrote much of its substance in a more popular style a year or two later and called it "The Natural History of Creation." This had an unusual sale for a book of this kind, but Haeckel was dissatisfied to see that the general public remained indifferent and unaffected by the new conceptions of the world and man arising from the studies of modern science. Worse still he observed with alarm a rising tide of reactionary thought at the close of the century, so he determined to make a final effort to influence his generation by appealing to the people. Therefore, he packed his science and philosophy into one volume of moderate size and published it in 1899 under the title of the "Riddle of the Universe." This time he hit the mark. The success of the

book was immediate and amazing. Many of us remember the tremendous sensation this book caused when first published in English. Ten thousand copies were sold within a few months; one hundred thousand within a year, and in ten years the sale of the German and English editions alone had passed the half million mark, not to speak of the fourteen other languages into which the book had been translated.

Please remember that to secure this wider audience, he did not resort to any of the ordinary methods, such as omitting dry details, avoiding technical terms and palliating popular view. "The Riddle" is not the sort of writing that goes by the name of popular science. It contains a technical discussion of questions in zoology and botany, in astronomy and geology, in anatomy and physiology, in palaeontology and anthropology, each in straightforward scientific language without any adornment or disguise. In fact, instead of dodging long words when necessary, he invented them when unnecessary, for few men have coined so many words as Haeckel. The immense popularity of the book, I think, was due to the personality of the author, more than to the character of the book. I do not mean that it was due to his reputation as a scientist, for the world cares little for scientific reputation. I mean that the book revealed a man tremendously in earnest and with unbounded courage, who had made up his mind on questions of the most vital importance, and who said what he thought in the most emphatic language, without regard for whose feelings he

hurt, even when he knew that he was contradicting the most sacred beliefs of humanity. Few books have ever caused so much heated controversy. Hundreds of criticisms and replies were published on every hand. The book was intended to draw the fire of the clergy, and it did. One cannot dogmatically deny God and the soul and immortality and free will, and advocate the spontaneous generation of life from inorganic matter without stirring the theologians to the boiling point. And it was not only the matter but the manner of his attack. He laid down these principles with the same dogmatism as the theologian declared his. He met fire with fire. No theologian ever affirmed the existence of God and immortality with greater finality than Haeckel denied them. Then too the volume invited attack not only because it was intentionally provocative, but because it was also unintentionally vulnerable. One does not have to be very learned to discover in it occasional errors, as well as many extravagant and questionable statements. The fact that few people could treat such a wide range of subjects without making more mistakes than Haeckel, did not of course protect him from criticism. Huxley, who enjoyed crossing swords with the clergy quite as much as Haeckel, was more careful to guard himself against counter attack; but Haeckel simply waded in with what knowledge he had and recklessly caricatured Christian beliefs.

Five years later he supplemented the "Riddle" with a similar popular volume, "The Wonders of

Life," in which he replied to certain criticisms and explained the biological principles on which his philosophy was based. Following this he wrote several books, such as the "Last Link" and "Last Words on Evolution," but none of them contained anything of importance. They were mostly a repetition of what he had already said in another form. He himself said, "Indeed I am wholly a child of the nineteenth century and with its close I draw the line under my life's work." But he lived on for twenty more years and like Spencer saw a reaction against many of the opinions for which he fought most earnestly. The nineteenth century was sure of a great many things which the twentieth century doubts. As the late Prof. Foster said in his lecture here on "Modern Psychology," its principal accomplishment has been not to learn anything definite, but to learn that what we thought was true is not true at all. And so with regard to many of the things for which Haeckel fought so strenuously. I do not refer now to the theory of evolution which was the general basis of all his thinking, but rather to some of the unjustified conclusions which he drew from this doctrine and taught dogmatically as though there could be no question of their truth.

III

In appraising Haeckel's life work, we may conveniently distinguish three of its phases—his contributions as a professional biologist, his popularizing activity on behalf of evolution, and his

philosophical formulation of a new religion on the basis of his scientific findings.

As a biologist, we have no particular interest in him this morning; only I would like to say that his importance in this field cannot be challenged. Apart from his significant additions to our knowledge of lower organisms, he enriched the philosophy of the animate world with a host of new conceptions, such for instance as the so-called "biogenetic law," according to which the life history of the individual is the life history of the race. He was the first to teach that the individual before birth, repeated and summarized in its embryonic development the history of its ancestry; that is, a man begins his foetal life as an organism not distinguishable from that of any other animal at the same stage; and before birth, he runs the whole gamut of his animal ancestry from the lowest to the highest forms of life; and after birth, the individual epitomizes the history of the race; that is, he is in infancy and childhood the savage and barbarian, and then unless his development is arrested, he grows into the civilized man. And it was by such generalizations that he made his greatest contributions to science. He had a creative imagination which made him a marvelous constructive genius. As Cuvier from a few pieces of bone could construct a whole animal, so Haeckel from scattered species ventured to construct as early as 1865 a family tree, including all living forms from the earliest life down to man. It is of course faulty from the standpoint of our modern knowledge; but when

we think of the skill with which he bridged the gaps in his living chain by hypothetical forms, it is marvelous. Just as the great Russian chemist, Mendeleef, was able to describe in advance elements which were discovered afterward and found to fit into the vacant places he had assigned to them, so Haeckel's anticipations have been mostly confirmed by later discoveries. The ape-man which he had described and named in 1885 was discovered in Java in 1894.

As a popularizer of the theory of evolution, his influence cannot be questioned. He was the first German biologist to give a whole-hearted adherence to the doctrine; it was he who first brought it to the notice of the German men of science; and Darwin himself has placed on record the conviction that Haeckel's enthusiastic preaching of the doctrine was the chief factor of its success in Germany. And this was done at a time when teaching evolution was a dangerous business—a challenge to the dominant powers of both church and state. And when we seek the reason for this activity, we are led straightway into the third phase of his life-work which I mentioned a moment ago—his world view, or his interest in philosophy and religion.

Haeckel did not dauntlessly breast the tempest because of any iconoclastic passion. The thing that appealed to him in evolutionary doctrine was neither its antagonism to the traditional conception of things nor its solution of technical problems that had puzzled the biologists of a previous generation. What appealed to him was

the fact that evolution was a method of linking together what had previously seemed unrelated in nature. It satisfied a deep-rooted longing for unity. Man was now no longer a being apart from the remainder of the organic kingdoms, but connected through an infinite number of gradations with the lowest forms of life. Not only that, but he stepped over the bounds of actual knowledge and asserted that man is one also with the inorganic kingdom, since life came out of inorganic matter by means of spontaneous generation. And he carried his theory also over into the mental world, asserting that psychology is merely a branch of physiology, and that mental activity is dependent entirely upon physiological processes in the brain. And so he taught that the highest faculties of the human mind have been evolved from the mental faculties of animals, just as the highest animals have evolved from the simplest forms of life.

Thus his vision embraced the inorganic and the organic portions of the universe as manifestations of the same underlying reality. He revolted against the current theology because it reduced existence to two distinct ideas, setting God over against nature, and spirit against matter. To him there was but one substance in the universe that animated rock and water, grass and tree, gorilla and man. And so we find that Haeckel was a mystic as well as a scientist; in fact, a rare combination of the two. This Monistic creed of his was nothing but the rapture of the mystic whose heart thrilled at the thought of cosmic

unity. And not only was he a scientist and a mystic, but he was a preacher as well. Like all great religious teachers, he felt an irrepressible longing to communicate the glories of his vision to other men. Hence his propagandist zeal of which the denial of Christian dogma was a purely incidental result. He repudiated a personal God and immortality, not from scepticism, but from greatness of belief; not because he disliked them, but because they stood in the way of something more wonderful. He cast these aside in the same spirit in which the apostles repudiated paganism, from an overpowering sense of the all-sufficiency of their own doctrine. His aggressive attitude toward revealed religion was in part provoked by the villification in reactionary circles, but it was primarily the attitude of a new prophet hurling anathemas against what he conceived to be the survivals of an outgrown faith, which stood in the way of a truer and more comprehensive belief.

I have no time this morning to go into a detailed discussion of his philosophy and religion. It is very easy for you to find out just what they are and study them for yourself, for he has expressed his views in very concise form and in the plainest language in his "Thirty Theses of Monism"—a sort of confession of faith for his lay-church, the Monistenbund. For strange to say, he took as much delight in creeds and dogmatic statements as any theologian, and he had the same implicit faith in formulas as capable of expressing everything in heaven and on earth. One reason why his conflicts with the clergy were so sharp

and bitter was because he had much the same type of mind and used similar language. In fact, this is one of the faults which I find with Haeckel. He offers as proved statements, formulas which are as unproved and as unprovable as those of the Nicene Creed or the Westminster Confession.

His religion, of course, is founded on the principle of Monism in contrast with Dualism. Monism is that view of the universe which holds that there is but one substance, one form of reality, whether it be material or spiritual. And Haeckel was a materialistic Monist as distinguished from Hegel who was a spiritualistic Monist. Hegel explained matter, sensation, individuality in terms of thought, while Haeckel explained spirit, sensation, thought in terms of matter. And in his enunciation of the law of substance, Haeckel showed himself to be a dogmatist as well as a scientist. Speaking for myself, I greatly prefer the doctrine of Monism to that of Dualism. I believe with Haeckel that there is but one substance of which what we call matter and spirit are both attributes; but I would not state it dogmatically as did he; neither would I insist upon the materialistic side of it as did he. Because after all we do not know what either matter or spirit is. Mind and all its qualities are indissolubly connected with matter, but it does not follow that they are matter or mere qualities of matter. In regard to atoms, by the motions of which Haeckel accounted for everything, there is no doubt that this theory best explains phenomena as we know it today; but we really do not

know what atoms are or even that they actually exist. It is the same with what we call mind. We feel certain of its existence, and we can trace many of its laws and manifestations as we can those of matter; but of its real existence and essence, we know nothing, and it is as unscientific to affirm as to deny. It is here that we stand face to face with the great Unknown, and in respect to such things I greatly prefer the attitude of Huxley to that of Haeckel.

Perhaps I should give you in a few words the gist of his creed. In form, it resembles the creeds of other religions—the same combination of cosmogony and ethics without any connection. It is divided into two parts—one called "Theoretical Monism" and the other "Practical Monism," and there is a striking contrast between the two. The second is in no sense a deduction from the first. His fundamental principles are bold and radical, while his practical conclusions are timid and conventional.

In the first half, he affirms that all the phenomena of human life and of the rest of nature are ruled by fixed and unalterable laws; but there is everywhere a necessary causal connection of phenomena, and that, therefore, the whole knowable universe is a harmonious unity. Thus there can be no distinction between nature and spirit. There is spirit everywhere in nature and there is no spirit outside of nature. The human spirit or soul is merely a force or form of energy, inseparably bound up with the material of the body. The thinking force of the mind is just as much con-

nected with the structural elements of the brain as the motor force of the muscles with their structural elements. Our mental powers are functions of the brain as much as any other force is a function of a material body. We know of no matter that is devoid of force, and no forces that are not bound up with matter. This applies equally to organic and inorganic bodies. "The magnet that attracts iron filings, the powder that explodes, the steam that drives the locomotive act by the same force as the sensitive Mimosa when it contracts its leaves at touch, or the venerable Amphioxus that buries itself in the sand of the sea, or man when he thinks. Only in the latter cases the combination of the different forces are much more intricate and more difficult to analyze than in the former." Thus the evolution of man is directed by the same eternal iron laws as the development of any other body. The various phenomena of nature only differ in the degree of complexity in which the different forces work together. And this leads him naturally to the philosophy of determinism. There is no such thing as free will. That which seems free is always determined by antecedent factors that can be traced either to heredity or adaptation. He tells us that the human will "is dependent upon the anatomy of the brain and is necessarily determined by the inherited characteristics of the individual brain." So we have here a kind of new Calvinism in which original sin is labelled heredity and predestination called determinism.

In this theoretical part, he knocks over every

stone upon which the structure of Christianity rests; but in the practical part he takes over intact the fundamental principles of Christian ethics, making the golden rule the basis of his system. He attacks, of course, certain forms of extreme Christian conduct such as asceticism and absolute self-sacrifice; but he adopts substantially the moral standards which the Christian men of his time and environment profess and endeavor to practise. I have no desire upon this occasion to attack or defend Christian ethics; but it would seem that such a fundamentally and radically different conception of the universe and of man would naturally issue in a fundamentally and radically different system of ethics; and he would at least have done the world a great service, if instead of taking a ready-made ethical system from a theology which he deplored, he had worked it out from his fundamental principles of evolution as Spencer, Kropotkin and Nietsche tried to do. If having done this, he had arrived at the same conclusions as the Christian moralists, his ethical system would have some force; but as it is, there seems to be no logical connection between the two, and therefore no particular reason for observing his ethical code. But I have no time to discuss this further.

To sum up my appreciation of Haeckel, let me say that he was a great scientist, a great propagandist, and a great philosopher. His greatness is best indicated by the statement of a critic that he served as a combination of Darwin, Huxley, and Spencer. Like Darwin, he was an original

investigator of patience, ingenuity and boundless learning. In one of his prefaces, Darwin testified that Haeckel probably knew more about the details of biological evolution than he did himself. His "History of Creation" is a work only second in importance to the "Origin of Species." Like Huxley, Haeckel was Darwin's bulldog. A polemic writer of unfailing skill and courage, he fought the battles of Darwinism for more than a generation, and put to flight the stoutest antagonists brought against him. Like Spencer, also, Haeckel was a philosopher, undertaking to build an original system of cosmic philosophy on the basis of the facts revealed and interpreted by the doctrine of evolution. Falling far short of Spencer's "Synthetic Philosophy" in scope and elaboration of detail, his Monism was, nevertheless, an amazingly daring and impressive attempt to explain the universe, and by many thousands of persons in Germany and throughout the world was accepted as a religion. In this triple capacity of scientist, propagandist, and philosopher, Ernst Haeckel ranks easily among the intellectual giants of his time, and therefore of all time.

But above all his academic qualifications, he was a man. He lived in accordance with at least one fine maxim of Nietsche, when he says, "Live dangerously." Hail the fight when the cause is good. Smite untruth wherever you find it. Contribute your mite to the growing wealth of the world before you go out of it. So to live is the highest enjoyment and use of life. Then when the sun sinks there are no regrets that the hour

of strength is over. Thus I like to think of Haeckel. Through all the fight and the fury, through all the persecution and vituperation, he was a man of splendid spirit, of inflexible principle, of the most genial humor, the most prodigal generosity, the greatest loveableness. The world is far better for his passage through it. It is hard to find his like in the universities of Europe and America today, and those who imitate his sturdy outspokenness find real inspiration in his life and works.

The street that leads up to his home in Jena is called Ernst Haeckel Strasse, and near this street, facing a small park, is a unique building, called the Phyletic Museum. It was founded by Haeckel to house collections illustrating the theory of evolution. On the wall is painted the genealogical tree of the human race, showing the various branches of life as it developed from the lowest forms and blossomed into man; and over the central arch is inscribed a quotation, which sums up Haeckel's whole philosophy, from the poet whom Haeckel most admired—Goethe:

Wer Wissenschaft und Kunst besitzt
Der hat Religion;
Wer diese beiden nicht besitzt
Der habe Religion!

It has been translated by Lange as follows:

He who Science has and Art,
He has Religion too;
Let him who in these has no part
Make his Religion do.

VII.

JOHN FISKE

We bring to a close today our series on "The Fathers of Evolution" in which we have been treating biographically that group of men who during the latter half of the nineteenth century brought about the greatest revolution in human thought the world has ever seen, through the establishment of the doctrine of evolution. First, under the title of "The Forefathers of Evolution," I outlined for you the development of the theory previous to the publication of the "Origin of Species;" then we studied the life of Charles Darwin and Alfred Russell Wallace, co-discoverers of the theory of Natural Selection and of the facts necessary to prove the doctrine. After these, we treated Herbert Spencer, the philosopher, who applied the principle to the whole realm of existence and re-wrote almost every branch of knowledge from this new viewpoint. During the last two Sundays, we have studied Thomas Henry Huxley and Professor Haeckel, the great protagonists of evolution in England and Germany respectively; and today we come to John Fiske,

who more than any one else, was responsible for its acceptance in America during this period. For many years, he went up and down the land lecturing on evolution and all kinds of allied topics; his facile pen turned out dozens of unanswerable essays in its defense; he wrote a system of philosophy which awakened people to its cosmic application; and he made an important contribution to the doctrine by pointing out the significance of the part played by infancy in the progress from brute to man. In his later years, Fiske devoted his time to the writing of history, and we think of him today as a great historian because he wrote history from the standpoint of evolution.

I

The outward events of Fiske's life were neither varied nor for a man of his attainments remarkable; but the study of his inner life with its astounding mental activity and insight is unusual and impressive. He was born in Hartford, Conn., March 30, 1842. His father was Edmund Brewster Green, who was descended from some Philadelphia Quakers. On his mother's side he was descended from a Puritan family — the Fiskes. The name given to him was Edmund Fiske Green, but after the death of his father and upon the second marriage of his mother, he took the name of his grandfather, John Fiske, with whom he lived in Middletown, Conn.

He was a very precocious boy. At the age of seven, he had read Rollin, Josephus and Gold-

smith's Greece. Before he was eight, he had read the whole of Shakespeare, a good deal of Milton, Bunyan and Pope. By eleven he had read Gibbon, Robertson, Prescott, and most of Froissart. He was particularly fond of history and mathematics. He began algebra at eight, and by thirteen he had finished plane and solid geometry, surveying and navigation, analytical geometry and was well into differential calculus. He began the study of Latin at six and at seven was reading Caesar. At thirteen he had read the whole of Virgil, Horace, Tacitus, Sallust, Seutonius, and much of Livy, Cicero, Ovid, Catullus and Juvenal. He began Greek at nine and at twelve had read most of the Greek authors prescribed for college students. An interesting incident is connected with his love of Greek. He was much in need of a Greek lexicon; but it cost five dollars, and this seemed to his grandmother a monstrous price for so useless a luxury, so the young lover of learning set forth to earn the money himself. He learned that an Irishman in the neighborhood bought old bones at thirty-seven cents a barrel. So he picked up bones here and there, as many others of us have done in boyhood days, until he had five barrels which brought him a dollar and eighty-five cents. In other ways he earned the remainder and became the happy owner of the lexicon. He also acquired the knowledge of many modern languages. All by himself he learned German, French, Spanish and Portugese. During his college years, he added eight other modern languages, besides Hebrew and Sanskrit. When one adds to this the

amount of science and philosophy that he absorbed, and then realizes the amount of time he gave to music and learning to play the piano well, I confess that he becomes skeptical, but I give all this on the authority of his biographers.

We cannot leave the story of his early boyhood without noting that at the age of fourteen he "got religion." He taught in the Sunday School, and upon occasions led in the prayer meetings; but this interest did not last long. One morning the minister in the course of his sermon said that the greatest joy of the elect in heaven would be listening to the agonizing groans of their less fortunate friends in hell. His sensitive nature revolted against that harsh and cruel theology, and thereafter he avoided the church which preached such dogmas. From this time on he was rather free in his criticism of the church and soon built up for himself in that restricted community a reputation for atheism.

He was ready to enter Yale college when thirteen years old, but decided later to go to Harvard instead, because of the more liberal atmosphere there. It was supposed that the Unitarianism of this college offered greater freedom, and having wandered away from the orthodox fold, he desired this freedom. He appears to have been disappointed, however, for the college seemed to him a "terrible den of old foggyism." In those days as well as today a student who studied was an object of wonder and suspicion among his fellows, and so all kinds of unpleasant rumors were afloat about Fiske as a result of the enormous

amount of reading he did. It was also whispered that he was an atheist. This was due no doubt to his interest in the then new Positive Philosophy which threatened the old fashioned doctrines, and which was considered godless. Then too Fiske's absolute frankness attracted especial attention. He boldly asserted opinions that shocked the ignorant and the timid by their supposed blasphemy and the wise by their assumed inappropriateness. He was once summoned before the faculty for reading in church and came very near being dismissed, not so much because of this single offense, but because he was considered a menace to the moral and religious life of the college community.

One or two incidents might be noted to show the young man's reputation for knowledge as well as the prevailing idea of students at that time. At a table a classmate put to him a dozen or more apparently impossible questions, all of which Fiske answered clearly off-hand, when another classmate said, "What in God's name, Fiske, did you expect to learn by coming to college?" Fiske writes, "The other day when reading over his Whately's rhetoric, Blank cried to me, 'Fiske, what the devil is an enthymeme?' 'Why,' said I, 'it is a syllogism with the major premise suppressed.' 'Well, what in hell is a syllogism?' was the reply. Great Zeus! I thought I should split. There's a specimen of Harvard scholarship." He also relates this incident, "A poll student told me today that twenty pipes of tobacco a day would not injure a man as much as six hours of study. I

asked that ignoramus if he considered six hours of study much? He replied he couldn't say as he never studied over three." You can imagine the impression this would make upon Fiske, who, we are told, averaged twelve hours of study a day for twelve months in the year before he was sixteen years old, and after that he averaged fifteen hours a day.

He was a prodigious student and an omnivorous reader, and it is important to notice that he was always busy classifying and co-ordinating what he had acquired. Every bit of information which he gathered seemed to go into its proper niche in his mind, there to remain plainly labeled until needed. It was this orderly arrangement that gave him command of his stores of knowledge. One is simply appalled at the richness of his storehouse of facts. He seemed to yearn to possess all knowledge, and his mind was capable of assimilating and using it. If you have any doubt about his intellectual maturity at this early age, turn to his works and read his essay on "Mr. Buckle's Fallacies" which was written in his second year at college. There is one characteristic of his knowledge which should be noted. It was gleaned from books. What he knew of science was not firsthand knowledge from actually studying and handling the elements, but was learned from textbooks. He was essentially a desk student and seemed to avoid all contact with modern laboratory work. He made use of the researches of others. He had the happy faculty of being able to take the results of other people's

discoveries and correlate them and draw the necessary generalizations for applying them to the problems of life.

But we must proceed with his biography. After leaving college, he entered the law school from which he graduated in 1865. He then entered a lawyer's office in Boston, and soon afterward opened an office of his own. But he really was not adapted to the practice of law. The loneliness of his office was most welcome to him as a secure retreat from interruptions, and it was with a groan that he heard the knock of his first and only client. While waiting for clients, he read history voraciously and soon decided to make literature his profession. At this point he settled down in Cambridge with the intention of conquering the world with his pen.

The remainder of his life might well be divided into four productive periods, two of great importance and two of lesser importance. The first marks him as an essayest and ends about 1869; the second covers the period of the preparation and publication of his "Outlines of Cosmic Philosophy" and ends about 1874; in the third period from 1874 to 1879, he is again the essayist; and from 1879 to 1901, he is essentially the historian, although this period is enriched by philosophical contributions of more lasting value than his earlier ones.

During the first period, what he wrote in the way of essays for the various magazines is not so important as the fact that during this period he was an open minded student. He now came in

touch with the theory of evolution as taught by Darwin and Spencer. He became an eager and ardent student of Herbert Spencer, whom he considered the greatest man of all time, and he determined to become the apostle of his philosophy in this country. To him evolution was the greatest light that ever came to man, and in it he believed could be found the solution of all things. So this theory filled him with rapture, and he became an earnest and enthusiastic seeker after every phase of knowledge that had any bearing upon the doctrine of evolution. And in his second period, his "Cosmic Philosophy" shows him as having attained what he sought; namely, the power and the right to state a philosophy of evolution in systematic form, and to apply it to all the principal fields of study that he had surveyed.

After the election of Dr. Eliot as president of Harvard, an entirely new atmosphere pervaded the institution, and in 1869, Fiske delivered a series of lectures there on the Positive Philosophy. As a result of these, he became an object of suspicion to the orthodox; but they were followed by a longer series of thirty-five lectures on the "Doctrine of Evolution," which formed the basis for his book on the Cosmic Philosophy. In 1870, he held a temporary appointment in Harvard as instructor in history and received a regular nomination for the place, but his name excited great opposition in the Board of Overseers. "What, an evolutionist, a materialist, an atheist to be made one of the instructors of Harvard College! Are we to hand over our young men at the most

susceptible age to insiduous and dangerous sophists, whe misread history and teach heresy?" Fiske's nomination was rejected. A year later, in 1872, it was thought that Fiske, now safely muzzled, might be made assistant librarian of Harvard, and this post he held until 1879. It was during this time that a devoted hearer of his lectures on evolution, desiring to see them in print and having heard that Fiske was withholding publication until he could consult with Darwin and Spencer and Huxley and other evolutionists in England, gave him a thousand dollars to cover the expenses of a trip to Europe for this purpose. He straightway received a leave of absence and spent almost a year abroad, during which time he finished his book on Cosmic Philosophy, the magnum opus of this period of his life, and as he said in a letter to his wife, "no fool of a job."

This book was, of course, his great contribution to philosophy. It is an exposition of what was then the new philosophy of evolution. The world was eager to know what was this evil spirit abroad, which was so greatly modifying the way of looking at the universe; and they found here a most lucid and intelligent exposition of what they wanted to know. Here he begins by tearing away the whole theological foundation of creation and redemption on which people's thought had been constructed and ends by building up the completely new conception of the universe as a product of growth, and outlining the promise which therefore lay ahead. It was, of course, built largely upon the philosophy of his master, Her-

bert Spencer, and was really intended to be an interpretation of Spencer's philosophy for the American public. But it turned out to be more that that, for Fiske was not a mere interpreter, he illuminated the subject in many ways. Faithful as he was to his master's main theses, he always interpreted them in a spirit of his own, and he added to them a number of new and characteristic doctrines, of which the best known is his theory of the influence of prolonged infancy upon social development.

After the publication of Cosmic Philosophy, there appeared to be nothing more to say on philosophy, for of course one cannot be expected, after he has written one system of philosophy, to sit down and write another; so Fiske turned his attention to what had always been his chief interest — history; and the remainder of his life was devoted largely to the writing of history and lecturing on historical subjects. He began his historical career with a series of lectures in 1878 on American History as a result of the interest created by the centennial celebration in 1876. This series was called "American Political Ideas Viewed from the Standpoint of Universal History," and the subject shows us how he regarded history and the spirit in which he would treat it. And indeed he did treat American history in an entirely new light. He did not merely extol the virtues of the American people, but his knowledge was so abundant that the growth of the American people appeared in its right proportion as an incident in the world's history. These

lectures were a tremendous success, and practically determined how he should spend the remainder of his career.

He thought at first that he would sit down and write a short history of America covering several volumes after the manner of Green's "Short History of England," but circumstances ruled otherwise. He became more and more popular and, therefore, more in demand as a public lecturer on historical subjects, the subjects being determined somewhat by the time and place. These lectures he would prepare at home during the summer months, setting forth in the autumn with a bundle of fresh manuscripts, and giving lectures in many places on his way to and from St. Louis, where he had a regular appointment as non-resident professor of history. In this way, between 1888 and 1893, he lectured five hundred and twenty-seven times on historical subjects, fourteen times on philosophy, and six times on music, besides preaching a number of Sundays in Unitarian churches. For twenty years, he wandered from the Atlantic to the Pacific coasts, delighting and instructing people with his philosophy and history. It was during one of his trips across the continent in the nineties that he occupied your pulpit on Sunday morning, speaking on "The Cosmic Roots of Love and Self-sacrifice." During the intervals between the lecture campaigns, he was constantly at his desk; and the result of this work was the series of histories, with which you are all familiar. The volumes took their shape almost by accident, to meet the

desires of the publishers and the interest of the public; appearing piecemeal as chance directed and not in chronological order. He hoped in this way to cover the whole era from Columbus to the Civil War, but some of the gaps were never filled. His method was to use his chapters as lectures, and after he had sufficiently tested them before various audiences, he cast them into final shape for printing.

It was during this period of historical writing that he gave to the world, first as lectures and later as published volumes, those four little books: "The Destiny of Man," "The Idea of God," "Through Nature to God," and "Life Everlasting," in which he discusses the most serious and the most unanswerable problems of life. A very complete notion of his philosophy and his attitude concerning the basis of religion may be gained from these books. He was not in any sense a religionist, but he was assured of what he called "the everlasting reality of religion" as a part of man's psychological equipment and as a factor in his mental and moral progress. His simple nature was full of reverence and the hopefulness of his temperament helped to make his message a cheerful one. As I look back upon those years during which I went through a great religious transition, I can think of no books which were more helpful to me than these four little volumes.

By the end of the century, his reputation had become established. His books and lectures had given his name great prominence. He spoke then, with the ripeness of years and the abundance of

knowledge, as a man of authority. Honors began to fall upon him. People wrote to him from all quarters of the globe with questions of all sorts about this world and the next. Honorary degrees were frequently bestowed upon him, and the recognition of his merit was general the whole world over. It was thought that he had many useful years before him, but his sedentary life with entire lack of exercise in conjunction with his indifference to dietary laws, resulting in a vast bulk weighing almost three hundred pounds, made it impossible for him to resist unusual and depressing heat, and when the extremely hot weather of the summer of 1901 came on, he was unequal to it and quietly passed away on July 4th of that year, in his sixtieth year.

II

Let us now look at a few of the characteristics of this unusual man and recall the service which he rendered to the world.

First, in regard to his physical features. In stature he was tall, fully six feet, and in later years, had grown so stout that he described his dimensions as seventy-two by fifty-six inches. He was of light complexion with curly reddish beard and grizzled hair. His immobile features and large spectacles suggested the stolid German professor; but he was unusually responsive, almost boyish in his frankness and enthusiasm. He was hail fellow well met with everybody, but most of all with children. His friendships included all

manner of men from Spencer and Huxley to the farmers about Petersham, where he had his summer home. And if you would understand his boyish pranks and enthusiasm, you should read some of his letters in the very fine biography by John Spencer Clarke. He had an extreme refinement of intellect, a strangely sensitive soul, and yet he was physically a big boy. He loved good things to eat and to drink and some of his letters describe what he had for breakfast or dinner in minute detail with the enthusiasm of a ten year old.

His home life was supremely beautiful. The enthusiastic devotion showered upon his wife and children in his beloved Petersham forms a touching story. Their influence in his life can hardly be overestimated. Petersham, with its associations of family happiness, was to him the symbol of intimations of heaven. When abroad, he compared every place with Petersham, and when he came to the loveliest spot of his wanderings in Italy, his rapturous expression of praise could find only these words, "It deserves to be called the Petersham of Europe." His homesickness during the delightful distractions of his last visit to England, spent among devoted and interesting friends, and engaged in the work which he loved best, was perhaps the most tragic note in his life. All the advantages of study available in London could not balance the mental distress caused by being absent from his wife and children. And this is a good illustration of the two sides of Fiske's nature — the deeply thoughtful student of philos-

ophy and history and the warm-hearted, affectionate, almost boyish lover of his family and home.

It is safe to say that no other American scholar has equalled Fiske in the variety of his learning and in his mastery of it. As a linguist, he used eighteen languages. His reading embraced all the best books of literature, ancient and modern. He explored all the great currents of philosophy and was thoroughly aware of everything done in the scientific world. He was a prodigious worker, but he did not work by schedule. On occasions, he would write ten or twelve hours at a sitting, while on other days he would do nothing. He was a great lover of music and sang well and played both the piano and violin. He was also a composer of no mean sort. His principal fort was as a lecturer. For many years, he was unquestionably the most popular lecturer on serious subjects in this country. Year after year, he delivered more than one hundred lectures annually in all parts of the country, and he frequently addressed equally enthusiastic audiences in Great Britain. His manner on the platform was simple. He had none of the arts of elocution. He had not even a sympathetic voice. And yet he held his hearers from first to last, not only once, but season after season. The cause is not far to seek — he invariably had something to say, and he said it simply, with downright veracity and frankness, and with a lucidity that appealed to every eager mind.

III

When we come to measure his service toward the establishment of the doctrine of evolution, we find it represented in three ways: first, he made a significant contribution to the doctrine itself; second, he applied the evolutionary method to the writing of history; and third, he was the interpreter and popularizer of the doctrine here in America.

In regard to the contribution which he made to the doctrine of evolution, I have time only to suggest its general outline. If you are interested, you will find it fully elaborated in his book, "Through Nature to God," and the originality of it defended in his "Century of Science." It must be remembered, of course, that in these earlier days Darwinism had left many problems unanswered, and one of them was the fact that somewhere in the process of evolution, the growth began to be mental and moral rather than physical, and that the tremendous physical struggle for existence gave way to the benefits to be derived from mutual helpfulness. Now Fiske pointed out that this change came as a result of the prolongation of infancy — that is, as the human child's period of immaturity was stretched out from a few weeks to many years, the necessary care and protection on the part of the parents during this period gave birth to what has developed into our whole system of social virtues, and forms what Fiske himself calls, "the cosmic roots of love and self-sacrifice."

The clue to this idea, he says, was furnished by Alfred Russell Wallace, who saw that in the general development of animal life a point must have been reached when variations of intelligence were more profitable than variations of body. From that time forth, intelligence gradually grew, while bodies changed but little, until by and by something like human intelligence of a low grade was achieved. After making this luminous suggestion, Wallace never followed it up. But Fiske pondered on it many years, when it finally occurred to him that this increase of intelligence was the cause of a prolonged infancy. With the lengthening of infancy, the period of parental help and care must have lengthened in correspondence, and in this way the sentiment of maternity became a permanent acquisition. The cow has strong feelings of maternal affection for a few weeks, but six months later she does not seem to distinguish her own calves from other members of the herd; but the human mother is called upon to exercise her maternal affection until it becomes a permanent part of her nature. In the same group of circumstances, the permanency of the marriage relation began. The father grew accustomed to defending the same wife and children and to helping them secure food. Cases of what we may term wedlock thus came into being. And not only that, but we have as a result of the prolonged infancy, a number of children forced to live together and through their necessary adjustments, learning the basic social virtues. Later these families develop into clans with large groups of helpless children,

and the division of labor and the necessity of "other-regarding" virtues became more developed, and so the variations with survival value came to be the mental and moral characteristics rather than purely physical ones. And this whole thought was worked out by John Fiske as an original contribution to the doctrine of evolution, which Herbert Spencer recognized as supremely important.

In the second place, Fiske was, I think, the first man to apply the principle of evolution to the writing of history. Previous to his time, historians dealt with biographies and events without any regard to their relationship to other events; but with Fiske every event becomes a part of the connected whole. According to the former method, the discovery of America was the result of the happy thought and heroic persistence of one man who wandered from court to court to persuade kings of his wild scheme. On his voyage he alone had faith, and he stands on the lookout like the hero of an opera. But Fiske saw in the movements of mankind not only the force of individual action, but also those greater impulses which sweep through all society. He sought to show not merely what things were done and who did them, but why they were done. Nothing shows this fact more clearly than his massive work on the "Discovery of America." There he makes clear that this important event was not the result of the happy thought of one able and persistent man, but a step for which the whole civilized world had been long preparing. The event is set in its proper relation to the world's history, and

yet without detriment in any way to the well-earned fame of Christopher Columbus. His main effort was not so much to add new facts as to arrange those already acquired in such a way that readers might understand why things happened as they did. This aim he did his best to make perfectly clear. Thus in his preface to the American Revolution, he writes that his "design was not so much to contribute new facts as to shape the narrative in such a way as to emphasize relations of cause and effect that are often buried in the mass of details." How well he did this any one who reads his histories knows. And this was a tremendously important contribution, because the study of history is important only as it brings out and emphasizes the causal sequence of events, for it thus becomes a guide to the understanding of the present and the improvement of the future.

But Fiske's greatest service to the people of this country was as an interpreter and popularizer. The public was aware in a vague way that new thoughts were astir in the world; that science had made vast strides; that the old theological formulas were crumbling; and that history was being re-written; but it had no man until John Fiske came along to act as a trustworthy medium between sound learning and popular misapprehension. He knew the best that was thought and written, he had a pre-eminent faculty for presenting clearly what he knew, and thousands of people all over the country looked up to him to be fed. That he was principally an expositor of evolution is no doubt true, but both Darwin and Spen-

cer gave him credit for being an expositor of the highest order. Forty years ago the ignorance and prejudice against evolution were dense and universal; and among all the forces that helped to overcome this ignorance in America, he was the greatest. He was among the first to understand the bearing of the new thought upon the whole of life. He was without a peer in re-stating the great problems of existence in terms of evolution with clear and penetrating power. And the fact that the doctrine of evolution by the end of the nineteenth century had become fairly well established among the more intelligent people of America, was due I think to the efforts of John Fiske, more than anything else. And the fact that there is a general ignorance of this doctrine today among the younger generation and as a result of this ignorance, a reaction against it, is due largely to the absence of any such figure as John Fiske in our life at this time. He is also the great popularizer of history. He had a style in writing and a charm of presentation that makes his histories read like novels. Men and women who have never been interested in history find themselves absorbed in the volumes of John Fiske. It is no exaggeration to say that more than any one else, he helped to put an end to the time when American history was the abomination of every school boy, the disgust of every collegian, and the aversion of the general reader. His charm of style, his lucidity of presentation, his unerringness in seizing upon facts of vital importance as well as of living interest lifted American history to the high-

est point in popular favor. Reading history is certainly a joy when it is Fiske who does the writing.

I cannot close this discourse without testifying to his superb honesty and his impartial devotion to truth, both in his philosophical and historical writings, as well as in the events of his daily life. If at any time there was shown him the unsoundness of anything he had written, he was the first to proclaim the error. He cared only for the truth and to be honest in his expression of what he believed to be true. None of his qualities impressed his friends more deeply than this. And nothing will impress more those who read his books today. In his volume entitled "Darwinism and Other Essays," there is a paper on education which sums up his whole attitude toward truth and the method of finding it. In it he says, "to teach the student how to think for himself and then to give him the material to exercise his thought upon — this is the whole duty of a university," and again, "it is desirable that our opinions should be correct, but it is far more desirable that they should be arrived at independently and maintained with intelligence and candor . . . . . Our motto should be, 'Think the truth as far as possible, but above all things think.' "

VIII.

THE STORY OF EVOLUTION

About a year ago I spoke to you on the subject: "Is Evolution a Fact or Only a Theory?" and we came to the conclusion that evolution is a fact. I showed that all of the eminent scientists of the world have accepted the doctrine of evolution as the basis of all their study and investigation. I reviewed for you the evidence in its favor and we came to the conclusion that in the face of this evidence, it is impossible to question the truth of the evolutionary doctrine. This morning we shall be in no way concerned with this evidence. We shall assume the fact that evolution is true and address ourselves to the path it has followed. In other words, I shall relate as simply as I know how the story of the development "from nebula to nation." Before beginning this story, however, it is necessary to be sure that we know what evolution means, so let me ask, without going into detail as to the answer, "What is evolution?" We all know the famous definition of it given by Herbert Spencer: "An integration of matter and concomitant dissipation of motion, during which

the matter passes from an indefinite, incoherent, homogeniety, to a definite, coherent, heterogeneity, and the retained motion undergoes a parallel transformation." I presume this definition is all right for scientific scholars who are acquainted with the foreign language of science in which Mr. Spencer speaks, but there is a much shorter and easier definition for those of us who do not speak the same language as Mr. Spencer, which expresses its central idea equally well. It is this: Evolution means growth. Evolution is simply the doctrine that everything which now is or ever was or ever will be, including the universe itself, is the outcome by natural laws and forces of all its preceding states. It is simply applying to the universe as a whole the principles which we know to be true of flowers and trees, of animals and men. It merely teaches that everything grew; earth and oak, universe and animal, solar system and soul.

For centuries mankind had believed in special creation, that men and animals and plants had been created in the beginning by the hand of an almighty God, exactly in the form in which they appear today; and that through all the years that have passed from the first morn of creation down to the present time, these various animals and plants have lived and died and propagated themselves without any change of structure whatever. This theory of special, divine creation was accepted by practically all of the people of the world, with a few exceptions, down to the publication of Charles Darwin's "Origin of Species."

And this hypothesis was accepted, not because it was based upon any observed facts, but simply because it was a venerable speculation which in the absence of any facts to the contrary seemed to be a fairly satisfactory answer to the problems involved. The evolutionary idea is very old, going back to some of the Greek philosophers, but it is only since the days of Charles Darwin, who gave the world the facts to prove this theory, that it has become an essential part of our mental equipment. It is now an everyday intellectual tool. It was applied to the origin of the solar system and the making of the earth before it was applied to plants and animals. It was extended from these to man himself. Then it spread to languages, to institutions, to governments, and to religions. Within recent years it has been applied to the chemical elements and likewise to the mental world as well as the physical. In fact, it is today universally applied—everything that exists is the result of the development from preceding states by natural laws and forces.

I

And now for the story which tells in a general way how this development took place. And in telling this story I shall follow rather closely the outline recently given by the British scientist, Dr. Yearsley. I am well aware of the fact that there are many disputed points, the merits of which I have not the time to discuss. For instance, there are scientists today who claim that in the forma-

tion of the solar system and the earth, the newly formulated Planetesimal theory has displaced the Nebular Hypothesis. Both of these theories on the whole are plausible, while both fail to explain certain facts. The Nebular theory is the one that has been generally accepted since the days of Laplace, and to me seems the more reasonable of the two, so I use it. The whole story is to be found in the four sciences of astronomy, geology, palaeontology and anthropology; and any of you who wish to follow it more in detail can do so by studying these four branches of knowledge. Astronomy long ago exploded the idea that the earth was the center of the universe, with sun, moon and stars revolving around it for the sole benefit of man. It teaches rather that the earth is a planet revolving around the sun, from which it receives heat and light. Besides the earth there are seven other large planets which also revolve around the sun. Some of these planets have smaller bodies called moons or satellites revolving around them. For instance, Jupiter has eight moons, while the earth on which we live has one. There are, besides the eight big planets, several hundred much smaller ones, called planetoids, which means "little planets." This arrangement of planets and planetoids moving around the sun is called the solar system. A glance at the sky on a clear night reveals an enormous number of stars which appear as mere specks of light. Their great distance from the earth running into trillions and trillions of miles prevents any estimation of their size. They number, that is those

which come within range of the telescope, about two thousand million, and the greater part of them are known as fixed stars because they apparently retain the same position in respect to one another. Now these fixed stars are like our sun and shine with light of their own. Their distance from us is so great that although many of them are much larger than our sun they appear to us only as twinkling points of light. The planets of our solar system shine, too, but their light is reflected from the sun and therefore not their own.

Also scattered through the heavens are certain misty patches of light which for many centuries perplexed the astronomers, but we now know what these are. They are luminous masses in a state of great heat and are called "nebulæ," meaning "clouds," and some two hundred thousand of them are found in various parts of space. It was from just such a cloud that our solar system evolved. Opinions are divided at present as to whether these nebulae are composed of gas or solid particles, there being three main theories. Some scientists believe the cloud to be composed entirely of gas; others maintain that it began as an immense swarm of meteors; and still others hold that the nebula consists of a cloud of solid particles supposed to have come from an explosion as the result of a collision of two dead stars. Which of these three theories is correct means very little, as it is undisputed that star systems or solar systems are evolved from nebulae. This process is practically as follows: The material of the nebula for some reason begins to revolve and

continues in constant motion around its center, like water stirred in a basin, gradually splitting into revolving rings, one within another, around a central mass. The rings gradually break up into masses until the nebula at last becomes a number of planets whirling rapidly around a central mass or sun. Such an arrangement is called a star system. There are many of them in the heavens, their suns being the fixed stars of which I have already spoken. Our solar system is one of them. They are in all stages of development from nebulae to complete systems, and there are some which by the gradual loss of energy and the slowing down of their revolving motion have become cold and dead. Our moon is an example of this kind.

Here geology takes up the story. The earth, once formed as a planet in the evolution of the solar system, was first a mass of intensely hot material which cooled very slowly as it circled year by year around its source, until a solid crust formed upon its surface. This thick outer crust formed the hard surface commonly known as land. Besides this land, however, there is on the earth a great quantity of water in the form of oceans, lakes, and rivers. While the globe was in the hot stage it was surrounded by a dense mass of steam and as it cooled this steam cooled with it and condensed into water. In cooling, of course, the earth contracted or shrunk and with this shrinking the surface was thrown into wrinkles like the skin of a dried apple, forming deep hollows in which the water collected, so that finally the earth became a ball covered with land and

water. Even when the earth had thus assumed the form which resembled its present condition, long ages passed before life appeared upon its surface; and it was in the water that life eventually had its beginnings. The details of the process of cooling and the changes that have taken place in the surface of the earth may be found in a work on geology.

II

This brings us to that stage in the development of existing things which is revealed by the study of palaeontology, which comes from two Greek words meaning "ancient being." Finally, when the earth had reached a stage when life could exist on it, life began. There are many interesting speculations as to how this life began, but I have no time to discuss them this morning. These living things from the beginning have left their records in what are known as fossils, meaning "to dig up," a name given to them because they are dug out of the earth's crust in which they lie. These fossils may be the stems and roots of trees, leaves, shells, parts of insects, bones, or foot prints of birds and animals, and so forth. From these remains the palaeontologist reconstructs the kind of life that existed in ages past, and this brings us to what is more specifically known as the theory of evolution as discovered and taught by Charles Darwin and his followers, that is, the story of the development of life from its lowest to its highest forms.

The form in which life first appeared was that of a jelly-like substance called protoplasm, which means "first moulded." This jelly-like stuff is the foundation of all life; it is the basic material of all plants and all animals. The simplest animal consists of a mere speck of protoplasm containing what is called a nucleus, the whole so small as to require a compound miscroscope to see it. Such a speck of protoplasm with nucleus is called a cell. All animals consist of either one or many cells. Man himself is a creature built up of an untold number of cells, somewhat as a house is built up of bricks, although different, of course, since man is an organism. The simplest one-celled animal is called protozoa, meaning "first animal," and many-celled animals are called metazoa, meaning "later animal." These protozoan animals consist of merely one cell, but have the power of movement, irritability, taking in food, throwing off waste matter, and reproducing themselves by division. The first metazoa were very simple in structure, such as sponges, corals, jellyfish and the like, animals with very few more attributes than protozoa itself. The next animals were wormlike, and from them branched off molluscs, such as oysters, snails and cuttlefish, and crustacea, such as lobsters, crabs and shrimps, also insects which have developed into multitudinous forms. Then came an extremely interesting group of animals which showed a new character, the forerunner of a great change of form. Up to this time all animals had soft bodies without bones, although many of them, like the oyster and

lobster, had developed shells to protect them. This new group had a gristly cord running through the body called the notocord, meaning backstring. This is the beginning of a backbone which came to be formed of a number of bones called vertebrae. The interesting little creature with the notocord is a lance-shaped animal called the lancelet. From this lancelet came the fish, first those with merely a gristly backbone like the sharks, and later those with a skeleton of bone like the salmon and the cod. From then on the animals all have backbones. Thus there are two great divisions of animals, the vertebrates or those with backbones, and the invertebrates, or those without backbones.

Then, as the water began to dry up and left land exposed, there appeared certain fish which became especially adapted to a life in mud. Instead of breathing like other fish from slits in the side or gills, they developed lungs for the purpose of breathing air, so as to meet successfully the struggle for existence; hence they are called dipnoids, meaning "double-breath." From these double-breathing fish were evolved the amphibians, meaning "double-life," animals able to live on land or in water, such as the frogs. From these came the reptiles, meaning "to crawl," which lived entirely on land and breathed air instead of water, such as the snakes. A branch of the reptiles developed into birds, but we have no time to follow these various branches—we are following the main stem of the tree of life which blossoms into man.

From the reptiles came the mammals, meaning "breast," which suckle their young. The first of these were curious creatures which, like reptiles and birds, laid eggs, specimens of which are still found in Australia and New Guinea. From the egg-laying mammal came the pouched mammals called marsupials, meaning "a little pouch," which gave direct birth to their young but at an immature stage, and which carried their immature off-spring in a small pocket in the skin. The kangaroo is the best known example. From the marsupials came a number of branches, but again we are interested in only one of them. This is the group of little tree-living animals called lemurs. From the lemurs sprang the apes and monkeys, and what is more important, man himself. Precisely through which branch man was evolved is not fully determined, but it is probable that one ape-like ancestor gave rise to branches from which came the gorilla, the chimpanzee, the orang-outang and the ape-man. Thus by means of evolution the whole series of animals ending in man himself came into being. The process has taken an enormous time. From the facts which astronomy, geology, and palaeontology have revealed it is estimated that at least eighty millions of years went by from the time when the earth was split off from its parent nebula until man first appeared. It is believed by some to be much longer than that, but this period is considered the shortest time in which the process could have taken place.

III

But we are still more interested in the evolution of man himself. Like other animals the primitive men who existed long ages ago have left fossils behind them. Skulls and other bones have been found in caves or in the gravels of ancient river-beds, so that anthropologists have been able to decide with considerable accuracy what these ancient men were like. I have time for only a very brief notice of these primitive men, but reference to any of the noted recent books on anthropology, such as "The Antiquity of Man" by Sir Arthur Keith, or "Men of the Old Stone Age" by Henry Fairfield Osborn will show that from an examination of fossil skulls men of modern type have existed for an enormous age, which puts back the period of time necessary for his evolution from his ape-like ancestors to a very remote date. Sir Arthur does not consider a million years too great an estimate. But besides his bones, which decay easily so that only a few of them are found, man has left behind him the implements that he made and used, axes and spears, hammers and knives. These are mostly fashioned out of stone, for it was a very long time before men began the use of metals.

The general consensus of opinion is, though this cannot be definitely determined, that the locality in which man first appeared was somewhere in the Indian Ocean, where land has been submerged since man was first evolved, although not within historic times. The earliest men were

probably very unlike any of the people, even the lowest savages, that exist today. They resembled much more, although they were also different from them, the apes, gorillas, and orang-outangs. They lived in caves, ate fruits and nuts, and probably used as weapons sticks and stones picked up at random. Later they made their implements out of flint which they shaped roughly by chipping. They existed for long ages in this condition, but as time went on they grew gradually more skilful and the implements they made showed better workmanship. At some period they became acquainted with the use of fire; how or where this happened is unknown. It is believed by many to have been from the accidental firing of dead trees or dried grass by lightning, some of which burning stuff they may have saved to keep a fire going for the sake of warmth. But what is more important, they learned at some time or other to make fire for themselves, probably by rubbing two sticks together or by striking two pieces of flint against each other, as some savages do today. With better weapons they took to hunting, and being able to make fire they cooked and ate the animals they killed, using their skins for clothing to keep them warm. The cavemen even possessed the art of drawing, for in this period we find pictures of animals sketched on pieces of ivory or slate, as well as on the walls of caves.

Later, after about six hundred thousand years of slow progress, man had improved. He had learned a great deal by experience, that is, by the trial and error method. He had very slowly de-

veloped a kind of speech so that he was able to hand his experiences on to his children. Consequently, his existence gradually became easier and he began to live more comfortably. He still made weapons and implements of flint and stone, but ground their edges and polished their surfaces. He made bows and arrows, too, and hammers and picks of stag's horn. He had learned to weave cloth for garments and to make pottery to hold food and water, and at some time in this period he began to cultivate a kind of grain. One of the most important things he did was to train the dog which has been the friend of man ever since. This probably was the result of making friends with stray wolves. Later man domesticated cattle and still later horses, so that his range of movement was greater and more work could be done. This early stage of man's progress is called the Stone Age, and is divided into the older stone or Palaeolithic age, and the later or more advanced stone or Neolithic age. It is now generally agreed that before the Palaeolithic there was an Eolithic age when man made the very roughly chipped flints recently found in the remains of ancient river gravels in England. Moreover, there must have been a still earlier period when he had not even reached the stage of flint work. These are known as the Stone Ages of man. It is important to remember that they do not refer to periods of time, but to degrees of advancement.

At last men discovered metals and when this happened they began to go ahead much faster. At first they used copper but this metal was much

too soft to be serviceable, so they soon learned to mix it with tin and thus make bronze. With the Bronze Age much greater progress was made. Men began to live together in larger numbers than before. During the Stone Age the cave-dwellers had gradually given up their caves for rough huts. Then two or three huts had grown into a collection big enough to be called a village. For a long time men thus lived in village communities, sometimes built out over a lake upon piles to be more secure from their enemies. With the Bronze Age many of these village communities expanded into towns, and some of the towns into cities. The simple huts had been gradually replaced by houses which during the age of bronze became in time more and more elaborate until they reached the size and stateliness of the dwellings found in Egypt, Assyria, Rome, and Athens. All of this took of course, a great deal of time, and was only a part of the gradual advances made in skill of workmanship and comfort of living. As soon as the village communities reached any size, men began to depend more upon one another. Thus classes like those of fisher, hunter, weaver and flint worker, gradually began and the foundations of social intercourse and social order were laid. Men found that when they wanted something that some other man could make more successfully than they, it was better to offer him for it things he could not make so well, than to waste time trying to make it for themselves. So barter came about. In order to simplify matters a medium of exchange was later invented in the form of

money; and out of this grew our whole intricate system of commerce and industry.

Thus life became more complicated and language developed enormously. With this increasing complexity of the Bronze Age there came about an invention which was necessary with the greater social intercourse and the beginnings of trade and commerce. It was something that made a greater change in human life than had ever taken place before or since. This was the invention of writing whereby it was not only possible for men to communicate with other men at a distance, but it enabled men to put on record the things they did and the thoughts they thought, so that those who came later could read what their forefathers had done and had known. Thus knowledge did not die altogether with its possessor and the wisdom of generations began to accumulate. The immense value of this to man's progress can easily be imagined. Of course, it must be remembered that the art of writing was not invented all at once. It grew by evolution from small beginnings, like everything else. It is impossible to say in what age writing began because its evolution must have been very slow and gradual. As a matter of fact one might say that the first caveman who thought to pick up a sharp flint and scratch upon the cavewall a rough outline of a bear he had seen was the inventor of writing, for the alphabet from which all of our words are formed had its origin in pictures, and the earliest known writing was picture writing.

So the art of writing probably took thousands and thousands of years to develop.

Then iron was discovered, another event which meant a very great deal to man's advancement. All the wonderful machines and inventions which seem a matter of course at the present day became possible through the discovery of iron and of how to work it. Thus, just as the earth has passed through all the stages from the nebula to the present day distribution of land and water, and just as life has progressed from the single-celled protoplasm to the complicated physical form of a mammal, so has man progressed from the use of sticks and stones to the use of engines and automobiles and aeroplanes. These stages of man's evolution are known as The Stone Age, The Bronze Age, and The Iron Age; and it is in the Iron Age that we are living. Naturally the more skilful man became the better weapons and implements he made and the faster he moved forward. It is certain that he improved much more rapidly in the Neolithic age than in the Palaeolithic and still more rapidly during the Bronze Age. So far as is known at present about six hundred thousand years passed between the first ape-like man and the end of the Stone Age, and only about thirty thousand years between that and the end of the Bronze Age. These computations are only approximate and are probably under rather than over-estimated. So far the Iron Age has lasted a little over three thousand years. If these three periods be added together the shortest time in which man could have existed

upon the earth is about six hundred and thirty-three thousand years, a period very different from that assigned by those whose only foundation for their conclusion existed in their imaginations. Under the old ideas man had less than six thousand years to achieve his present condition, but the men of science assure us that not only did man progress very slowly but that he has had at least one hundred times longer to do so than was formerly believed.

But when we talk of the progress of man from the earliest times to the present, it must not be thought that all men have progressed at the same rate. There have been ups and downs, old civilizations have been destroyed or died out and new ones have arisen. There are races of men today who have never risen above the primitive state. In Africa, Australia and the South Sea Islands are savages who still use stone implements. They are the stragglers who have dropped out in the long wanderings and migration of primitive peoples before civilization was attained. They have not advanced either because they were incapable of improvement or because they were cut off from the advantages enjoyed by other races. By the study of these peoples we gain some conception of what our far-off ancestors were like, and we can recognize the many savage survivals that modern man shows at every turn, mental survivals as clear to the psychologist as are the traces of animal ancestry in our bodily structure to the biologist.

IV

Now very briefly I want to ask why man has made the progress that has just been sketched. Why has he thus transcended the other animals? One answer is that man thinks about things. But man is not the only animal that thinks; many other animals think, although most of them appear to do so only vaguely, and there is a limit to their process of thought. But they think as much as men thought at the beginning and so it is evident that man has not reached his improved condition solely by thinking. Again it has been said that one of the characteristics which distinguish man from other animals is that he is a tool-using animal. It is true that the ability to use his hands has been of inestimable value to him but this does not answer the question entirely either, for we find some of the higher classes of animals using sticks for defense and stones to crack nuts. Primarily the thing that contributed most to man's advance was the development of the means of communicating with one another, that is, the ability to talk. It is of course true that many animals communicate with one another by making sounds and that this might in a sense be called animal speech, but the sounds they make are so limited in number and can express only such general conditions as anger, fear, hunger, contentment, and warning, that they can hardly be compared to human speech. Of course, these communications by sound in animals are a part of the evolutionary process which resulted in human speech, but the

animals have not learned to communicate more than general feelings. Now it is man's ability to speak that has enabled him to think so much better than the other animals. We think only in terms of language and it is impossible to think except as we formulate that thought into symbols such as words. And so speech assisted man to clear his thoughts as well as gave him a vehicle in which to express them and communicate them to his fellows. It is speech that enables man to reason and above all it is by means of speech that men are able to discuss things among themselves which more than anything else develops thinking.

Growing out of this is another great factor that distinguishes man from all other beings, and that is the faculty of askings questions. This is no doubt the greatest factor of all. Animals show curiosity but are unable to communicate that curiosity to other animals and so its satisfaction is limited to the individual's ability to think. The lowest tribes of savages are likewise curious and keenly inquisitive about everything, and because they can ask questions of one another and exchange thoughts and talk about things they have the power of improvement. The fact to bear in mind is that man differs from all other animals because he is the only one that can ask questions, and asking and answering questions is the very condition of brain development. So man's progress is due to his development of brain power as the result of asking and answering questions. In studying the various animals which have been evolved we know that many of them have sur-

vived because they became specialized,—some for strength, as the elephant and the lion; some for combat, as the stag and the tiger; some for swiftness of movement, as the deer and the greyhound; some for endurance, as the camel, and so forth. Now man has specialized in brain and developed the power to think largely through his development of the ability to speak.

Parallel with this ability to speak developed the social life of man. Because of the dangers to which he was exposed early men found it necessary to live together in groups and this living together probably did more than anything else to develop speech. The idea of grouping together was no doubt suggested by the family instinct which man possessed from the beginning, and as the family increased the groups in which they lived increased, and these groups are known as tribes. As men multiplied the number of tribes increased and with this increase the struggle for existence and the difficulties of obtaining food became more intense, so that tribe struggled with tribe for the bare necessities of life, and the weaker ones went under. Moreover, the search for a living tended to migration, causing men to spread themselves over wider tracts of country, following the lines along which the land was most fertile and suitable to their wants. The common need compelled them to realize the necessity of helping one another, and that the safety and well-being of the tribe depended upon mutual co-operation and assistance within the tribe. And here is the beginning of morality. Living so as

not to injure or annoy his fellows became necessary. Working together was the only thing that could make the tribe successful. Thus developed the tribal instinct, when the tribe became everything to its members and all strangers were considered as enemies.

Then as the tribes grew larger and more organized they leagued together and the tribal instinct or consciousness grew into the national consciousness with all that the word patriotism implies. This is an extension of the tribal consciousness, but fundamentally it is the same thing on a larger scale, for now the nation became everything to its members and all other nations were considered enemies. This is the stage of social evolution in which we are now living, and that is why I called this address "From Nebula to Nation." But this does not mark the end of the evolution of our social organization, for beyond the nation is the world, and beyond the people of one country is the great circle of humanity. And just as in the early days the individuals found that mutual co-operation and assistance was necessary to the existence of the tribe, as later this mutual co-operation and assistance was extended to many tribes or the nation, so in the future we will find that it is necessary that this mutual co-operation and assistance be extended to the world, if humanity as a whole is to survive. So that the next step in the evolution of social organization will bring us to the day when men shall recognize that our first and highest duty is to mankind as a whole and not to any single section of mankind.

In fact, we are beginning today to develop this world consciousness, what some one has called "planetary consciousness," the consciousness which recognizes that here we are on this little planet and that it is disastrous for us to be divided up into antagonistic groups, while it would be greatly to our benefit to be bound together in a spirit of universal co-operation. And I feel sure that the day will come when all men will feel what some men now feel, what has been called "the enthusiasm for humanity," which extends its sympathies to human beings not because of any particular relationships, nor because they live in the same country with them, but because they are men and live on the same planet with them; and then men instead of wasting their efforts fighting one another while being devoured by their common enemies such as ignorance and poverty and disease, will unite in peace and harmony for the overthrow of these common enemies. And for this time, as Mr. Van Loon suggested on Thursday evening, we must not be impatient. Astronomical mathematicians assure us that this little planet has still another ten million years to go before the sun grows too cold to sustain human life, barring accidents, of course, such as a collision with some dead star. So if man has reached his present condition in one million years, he still has great opportunities ahead of him. But it must be remembered that his present position was reached through the development of brain power and the acquisition of knowledge, and his future development will depend upon the same

thing. Knowledge is the thing men need—knowledge, and that which comes as the result of knowledge—understanding, sympathy, and mutual helpfulness.

IX.

THE PROOFS OF EVOLUTION

My subject this morning is "The Proofs of Evolution," and I confess that I feel somewhat humiliated to stand on this platform before such an audience and discuss this question. Every subject that I have ever treated from this pulpit has been discussed from the evolutionary point of view, having accepted evolution as a fact when I first came into contact with it as a freshman at college; and I have always felt assured that this question was settled by the great controversy of fifty years ago. It was as early as 1876 that John Fiske wrote in his Cosmic Philosophy, "Evolution is a permanent acquisition of knowledge. Whatever else the philosophy of future generations may be, it must be some kind of a philosophy of evolution." And only a few years later, 1880, the great English scientist, Thomas Huxley, declared that "Evolution is no longer a speculation, but a statement of historical fact. It takes its place alongside of those accepted truths which must be reckoned with by philosophers of all schools." And this has been the stand of the best scientists and

scholars since that time. About the year 1900, Alfred Russell Wallace said, "Evolution is now universally accepted as a demonstrated principle, and not one single writer of the slightest eminence that I am aware of, declared his disbelief in it." Only a few years ago, Prof. Kellogg, one of the ablest living biologists, said, "Evolution is regarded to be as proven a fact of biology as gravitation is in the science of physics," while Prof. Davenport, another prominent biologist, declared, "I do not know a modern scientific man who does not believe in evolution." And within the past week, President Morgan of Antioch College, wrote, "The present controversy between fundamentalists and evolutionists is but the echo of a battle won a generation ago. A treatment of biology or geology which does not accept evolution is today as impossible as a course in geography which denies the earth to be round."

I might multiply such statements indefinitely, and yet there has opened up within the last few years a direct attack upon this very doctrine which is being conducted with furious intensity. For some months this assault confined itself to the ignorant pulpits of the Christian church, but recently it has been organized into a great popular movement which threatens to sweep the country from end to end, and which will be satisfied not only with the attempt to disprove evolution, but only with the prevention of its mention in the schools by legislative enactment. And so this old and almost forgotten campaign against the evolution theory has been revived and is gathering

amazing momentum, and it behooves us to prove once more what Darwin, Spencer, Huxley, and Fiske proved a generation ago.

I

I do not care to spend much time on what these Fundamentalists have to say about evolution—their arguments are too absurd, but I must refer to a few of them, in order that you may know the nature of this attack upon evolution, and also that you may compare the value of such arguments as they use against evolution with those which I shall use in its favor. They begin with the familiar argument of human pride. Evolution, they say, as applied to man, is an insult. It destroys man's family tree as taught by the Bible, and makes him a descendant of lower forms of life. In brief, they feel that it is more respectable to be a fallen angel than a risen animal. This is of course a matter of taste. I prefer to believe that man has grown to his present attainments from very lowly origins rather than that he has slipped back from a previous state of perfection. They object to being descended from monkeys; but evolution does not teach that man is descended from monkeys. No single form of existing ape or monkey is in the line of man's ancestry. They are only remotely related. For instance, the Dutch are not descended from either the English or the Germans, but they are related to both through a common ancestral tribe of some thousands of years ago. And so the living apes and monkeys

are related to us only through a common ancestral tribe of three or four million years ago. We both descended from the same stem, but neither of us descended from the other. Next they venture the assertion that the theory of evolution is increasingly discarded by scientists. This of course is due to an ignorance of distinction which I shall come to in a moment.

Then after this prelude, we come to the three specific objections on which they rest their case. First, evolution is only a guess. Scientists call it a hypothesis, but hypothesis and guess are synonymous. Think of these ignorant Baptist and Methodist preachers calling the result of all those laborious years of observation and experimentation on the part of the finest minds in the world—only guessing. Second, they say there is not a syllable in the Bible to support it, and why do they not add "neither is there a syllable in the Bible to support the theory of gravitation, nor the Copernican astronomy, nor the modern geology," and so on. They do not seem to be aware of the fact that not since the middle ages has the Bible been accepted as a textbook of science. Third, they cry in shrill crescendo, "Neither Darwin nor his supporters have been able to find a fact in the universe to support the hypothesis." This statement I shall answer fully in a few moments, for it is to answer this that I speak on this subject this morning; but before coming to this, I must refer to another statement or two in order to show you the purpose of this whole assault. A noted Fundamentalist cries, "Evolution is a hypothesis di-

rectly and irreconcilably antagonistic to the Bible," while another declares, "Those who teach Darwinism are undermining the faith of Christians." Here you have the crux of the whole matter. These people are not interested in the truth, but in the propagation of a certain religion. So you see we are not meeting anything new. That was the kind of thing that was said by the men of the Inquisition.

The story of the church's opposition to such undermining is written in blood in the annals of Christendom. This is but the most recent battle in a century-long warfare between theology and science. Theology, as defined in the past and mostly understood today, is the foe of enlightenment. In order to maintain its infallible and unchanging dogmas, it has fought every new theory advocated by science. Its warfare of persecution and torture is a revolting story. The Protestant attitude is no different from that of the Catholic—"Compel them to come in"; and it has a Servetus to match a Bruno; only the Catholics have a longer and a bloodier record; but today I would rather take a chance with Father Cleary than with Dr. Riley. Theology has always fought a losing battle and always must. I suggest to the younger generation that they read that awful story if they have not done so—read it in Lecky, White, Draper, or briefly in that little book by Prof. Bury, "The History of the Freedom of Thought." That distressing and humiliating story of man's cruel intolerance—far more humiliating to man than being descended from lower forms

of life—should be carefully conned by these Fundamentalists; and especially those recent chapters reporting the battle against evolution which we had thought was closed. And while it may seem strange to be going over ground so familiar to most of you, yet I find that the younger generation is practically ignorant of the facts of evolution, and so I devote this morning to what after all is the fundamental question; namely, Is evolution a fact or only a theory? If the evidence is sufficient to establish the truth of evolution, then it must be accepted regardless of what happens to the Christian religion or any other religion. And when I am through, I think you will agree with a noted Fundamentalist that "They cannot make a monkey out of him," the reason being that he has already made a monkey out of himself.

II

In order to understand evolution in its relation to Darwinism, and as now attacked by these Fundamentalists, we must glance at the thought which prevailed previous to the work of Charles Darwin. At that time there were just two possible explanations of the existence of things upon this planet. The one was the theory of direct creation by an omnipotent God within a few days' time as described in the book of Genesis. According to this theory, the whole universe and all that is contained therein was suddenly made out of nothing by the direct command of God, exactly as we see it at the present moment. Every different species

of mineral, vegetable, and animal that exists today was created then. This theory of creation was accepted by most of the great scientists of the time, not because there was any evidence to establish it; but in the absence of any evidence to establish any other theory. As men looked about them, they saw that most of the things were made by men, and a very plausible hypothesis was that the world was similarly made by the direct will of God.

Then there was a second theory, which had long existed, known as the theory of evolution or growth, based no doubt on the fact that men had always seen about them the processes of growth; and they deduced from this that just as trees grow, animals grow, and men grow from infancy to manhood, so did this world grow into its present form from some earlier and simpler form. Most people think that Darwin invented or discovered the idea of evolution; but evolution theories are as old as the philosophers of Greece. From the remotest time some have believed in the development theory; but it was only about a hundred and fifty years ago that evolution was presented as a definite scientific hypothesis by a group of distinguished men. These men insisted that our existing complex forms of life have developed through innumerable years from simpler forms. But in the absence of all evidence to support the theory, they were unable to make the doctrine convincing, and during the next generation it had almost completely disappeared from the scientific

mind. The only person of importance in the period just previous to Darwin, who was a thorough-going evolutionist, was Herbert Spencer. The prevailing theory of existence at that time was that of direct creation and not of evolution.

It was in such circumstances that in 1831 Charles Darwin, only twenty-one years of age, set sail as official naturalist on H. M. S. Beagle, and thus began one of the most important voyages in the history of the world. I have no intention of relating to you this morning the thrilling story or Darwin's experience on that long journey along the coasts of South America, Africa, and the Pacific Islands. It is only necessary to say that while investigating the animal and vegetable life of these countries, he noticed certain things which did not harmonize with the theory of direct creation. As he observed more and accumulated data, he was forced against his will to believe that the creation theory was simply impossible and that the theory of evolution in some form or other was true. And when he returned to England in 1836, he decided to devote the remainder of his life to the investigation of this interesting and perplexing problem. And thus for twenty years with ceaseless devotion and unremitting patience, Darwin gave himself to the study of this problem, and finally prepared his material for publication in the form of a book which appeared in 1859, under the title of "The Origin of Species," one of the supremely great books of all time, which has created the greatest revolution that has ever taken place in the thinking of man. Now, Darwin

through his book, accomplished two things, both of which I must emphasize, if you would understand the present controversy.

In the first place this book did what we are most interested in this morning — it presented the facts which proved the theory of evolution to be true, in so far as it is possible for the human mind to establish anything as true. Of course, evolution cannot be proved in the sense that a mathematical formula can be proved; but we know that it is true because nothing else can explain the facts, while this does explain the facts. It is the only scientific interpretation that has been suggested that fits the facts, and all the facts it fits are its "proofs." These facts involve such a mass of data that one could spend a lifetime in studying and arranging them; and yet these Fundamentalists tell us that there are no facts which prove the doctrine true. It is almost inconceivable that men who are supposed to be intelligent and who come into contact with the literature of this generation can be so ignorant as not to know the existence of these facts. And when one remembers that they are standing on the shelves of every public library in the land, he is forced to the conclusion that they have carefully avoided them that they might preserve their primitive faith. Not long ago I asked one of these people to read Van Loon's "Story of Mankind," and he refused on the ground that he did not want his faith disturbed.

III

It is of course impossible for me to suggest in this short time the amount of facts which demonstrate the truth of evolution. Merely to catalogue these facts, without any explanation would consume days in the telling. All I can do at this time is to confine myself to several classes of facts, and mention from these classes one or two individual facts which will at least indicate what they mean. And for this purpose I venture to bring to your attention certain facts in the field first of embryology, second of anatomy and physiology, and third of palaeontology and anthropolgy; or what might be known as the prenatal, the structural, and the historical evidences of man's ascent from lower forms of life.

If we turn to the field of embryology, which is the study of the life of an embryo, that is of an animal from the time of conception to the time of birth, we find some of the most interesting facts bearing on the theory of evolution. And if we trace the development of the human embryo, from the first microscopic cell to the fully fashioned body of the infant, we find revealed the whole story of the evolution of earthly life. Each embryo, that is, reproduces in the mother's womb the life history of the race. In the beginning it is a single minute cell, and as it develops it shows no indication of being human, but rather appears to be that of different kinds of animals. It soon presents the appearance of a worm without head or backbone or limbs. Then it passes through the

higher forms of invertebrates, during which no scientist can tell whether it is the embryo of an animal or of a man. Then the backbone appears and we know that the embryo belongs to the vertebrates, but whether fish, animal, or man, no one can tell. And then comes that remarkable succession of forms in which it is first the embryo of a fish with gill-like clefts, then of a serpent, then of a mammal, until at last it develops into the monkey stage, marked by the fact that the body is covered with long hair and possessed with a lengthy tail. Finally in the last few weeks of its life in the womb,there appear the first indications that it is the embryo of a human being — having developed an enlarged brain for thought, a larynx for speech, and all those elements peculiar to man. Thus man in his embryonic form is a recapitulation of all previous history. The human embryo bears the marks of its ancestry, and develops along the same course that man himself has followed. From the standpoint of the doctrine of creation, this embryological story is a mystery which cannot be solved; but from the standpoint of evolution it is exactly what is to be expected. And this fact that the embryos of the dog and of the ape and of the man are alike in most particulars is evidence of a common origin which no amount of quibbling can destroy. Of course the Fundamentalist simply denies these facts of embryology; but they are proved beyond any question of doubt. They have been investigated and studied in all their various forms; as a noted scientist said, "they have taken their place in

science wholly apart from the discussions of the theory of evolution, and as the result of laboratory investigation made for quite other ends."

Let us now turn to the field of human anatomy and physiology; that is, the study of the structure of the human body and its functions. First look in the field of anatomy, and you will find all through these bodies of ours the proof of our descent from lower forms of animals — evidence which tells the story of our origin as clearly as if it had been written there with pen and ink. In the first place, the general structure of the body is almost identical with that of the anthropoid apes. Bone for bone, muscle for muscle, blood vessel for blood vessel, nerve for nerve, man and ape agree. Of course there are differences, but they are unimportant, and are the result of the different lives we have lived since man has developed an entirely upright position and no longer uses his hands for support. But perhaps the most convincing proof is what we call vestigial organs; that is, organs which were once of use, but have atrophied through disuse. The human body is a veritable museum of relics of this nature. For instance, in the inner upper corner of the eye there is a minute tag, which is the last dwindling relic of the third eyelid used in cleaning the front of the eye, which most mammals possess in a large and well-developed form. Or, again, the distinctive mark of the fish is its peculiar apparatus for breathing, which we call the gills; and these gills of the fish are still represented in the human neck, proving conclusively that we once

lived in the water. Children are sometimes born with open gill-slits in the neck just below the ears, open inside and outside, just like those of a fish. Somewhat more common is it to have the position of the gills marked by a ridge of white skin. And even those of us who are perfectly normal carry the most conclusive evidence — that is the ear, which is nothing but the development of the upper gill-slit of the fish. Mention of the ears suggests another proof of our animal origin to be found in these little organs. Practically all animals are able to move their ears. Man has lost the ability to do this, but it is interesting to note that the muscular apparatus for this purpose is still attached to our ears as in the case of a dog or a donkey. These muscles have become atrophied through disuse, but they are there just the same, and occasionally there appear human beings who are still able to use them.

One of the best known of these surviving organs is the appendix. In many of the lower forms of animals this organ is a regular part of the digestive system. Food enters it and it secretes chemicals and absorbs nourishment into the blood like the stomach and intestines. But in man for some reason and insofar as we know, this organ is of no use. Food never enters it, except by accident, when we find it necessary to send for a surgeon. In time it will probably pass away entirely like the legs of the snake, and the claws on the wings of the birds, and people then will have to forego the rather popular pastime of having it removed. I will mention just one more

of these astonishing pieces of evidence, one which should greatly interest these people who seem so disturbed at the possibility of having descended from a monkey. Not long ago, Dr. Riley was asked in a debate why he had these useless organs known as vestiges, if evolution is not true. Dr. Riley replied that aside from his appendix he did not have them; but if Dr. Riley would do what Sydney Smith once said on a very hot day that he would like to do; namely, take off his flesh and sit in his bones, he would discover that he carries about with him the rudiments of a tail. In other words, at the end of his spinal column he would see four or five vertebrae curving upward in a most suggestive fashion. At first he might deny that this is a relic of former days; but if he would put his flesh back on, he would again discover that clustered about these bones are certain muscles which once were used for the wagging of this tail. And so I might go on enumerating evidences of an animal origin in our bodies. A great naturalist has shown that the body contains one hundred and eighty of these relics of animal descent. Take away the theory of evolution and there is no explanation of these phenomena. Accept this theory and their meaning is apparent. As Darwin said, they are like the unsounded letters in words, such as "o" in leopard and "b" in doubt. They are of no use but they tell us something of the history of the words. So man's vestigial organs reveal his pedigree. They must have an historical or evolutionary significance. No other interpretation is possible.

If we turn to physiology, the study of bodily functions, we find a like similarity. The every day functions of the human body are practically the same as those of the anthropoid ape, and similar disorders are common to both. The circulatory system, the digestive system, the muscular system, all work in practically the same way, and the various glands of the human body are almost identical with those of the apes. But perhaps the most convincing proof, at least in the mind of Prof. Haeckel, is the similarity of blood content between man and the higher forms of apes, established by the recent experiments of Dr. Friedenthal and others. It has been shown that if the living blood of two nearly related animals of the same family, such as the dog and the fox or the horse and the donkey, is mixed, the blood cells of each species remain uninfluenced; but if the living blood of two animals not closely related, such as the dog and rabbit, is mixed, or that of the horse and the fox, a struggle for life between the two kinds of blood cells immediately takes place. Now in this connection, it has also been shown that the blood of man has a destructive effect upon the blood of all animals and even the lower apes, but has not that effect upon the blood of the anthropoid apes. The absolute truth of these reactions has been established by hundreds of thousands of experiments, and proves without question the blood relationship of man and anthropoid ape.

Let us now turn to the field of paleaontology and anthropology, in which we find what might

be called the historical evidence. Paleaontology has to do with fossil remains; and here we have the most convincing proof of all. I refer of course to the remains of extinct animals embedded in the rock of past ages which show us the various forms through which life has developed. There is such a wealth of material here, that one scarcely knows what to choose for such a brief discussion; but I shall mention just three things. In the Slavonian lake region of Europe, there are many dried up lakes once densely populated by snails. As these little animals perished from generation to generation, their shells sank to the bottom and became embedded in the mud. This took place for millions of years, each succeeding generation of snails depositing its shells on top of the preceding generation. A deep shaft has recently been sunk through this soil, and it has been found that the shell deposits constitute a perfect series of changing forms, the ones at the top being so different from those at the bottom as to constitute an entirely different species; yet from layer to layer they seem to grade into one another so gradually as to be practically imperceptible.

Another example. At present, we know the animals are perfectly well defined from the birds, the birds from the reptiles and the reptiles from the fishes, that is to say, there are no intermediate forms to show us the transition from one of these groups to the other, there are no creatures which are part fish and part reptile, or part reptile and part bird. But during the past two generations many such intermediary animals have

been found in fossil form—creatures that had the general structure of a bird, but had also the skin and teeth of a snake; creatures that had all the aspects of a reptile but stood erect upon hind legs, and flapped paw-like forelimbs which were destined later to develop into wings. For these anatomical details, you must read Huxley's second lecture on Evolution; I merely mention them here to emphasize the fact that the study of palaeontology reveals to us these intermediary forms which are of course necessary to the theory of evolution, and fatal to the theory of creation.

But the most remarkable collection of facts are those in connection with the evolution of the horse. There has been discovered by Prof. Marsh of Yale a vast accumulation of bones in our western states which give a complete history of the evolution of the horse, covering a period of more than two million years. Near the surface of the rocks of course were found the remains of the immediate ancestors of our present horse; and then as he went deeper and deeper he came to ever older and older ancestral forms, and when he had finished his labors, he had arranged a collection of the horse family, proving that it rose by evolution, or gradual change, from a four or five toed ancestor about the size of a fox, living some two million years ago, to the superb animal we know today. Collections of these bones are to be found in the Yale Museum and in the National History Museum of New York. To look upon these collections and disbelieve in evolution is as absurd as to look upon a collection of arrow

heads, spear points, and wig-wams, and disbelieve in the existence of Indians.

And then there are the fossil remains of human beings, which brings us into the field of anthropology. These have mostly been discovered since the days of Darwin, and supply the famous missing link of which we used to hear so much. Here again is material for a whole hour's discussion on the famous ape-like men, found in various parts of the world, which form indubitable proof that man has descended from an ape-like ancestor and has a history of half a million years at least upon this planet, and strange to say not a single one of these discoveries failed to fit into its proper place in the theory of evolution. I cannot go into this phase of the subject, but suffice it to say we have specimens now of beings which have assumed many of the characteristics of man and which have not yet thrown off the characteristics of the ape; and here in these bones lies the record of our ancestors which shows a kinship with the ape as surely as a kinship with ourselves.

Now I might go on into other realms of proof, such as contemporary evolution, and show you that evolution is taking place about us on every hand if we have eyes to see. There is no use saying that new species cannot develop, since we can make them develop. Men who breed cattle and horses, dogs and chickens, know perfectly well that they can produce new species by the continued selection of types in the breeding process, and the discarding of undesirable types. You will remember when Mr. Burbank was asked to

attend the trial at Dayton, he said he was too busy causing evolution to spend time talking about it. And this is literally true. Mr. Burbank has made many new kinds of trees and flowers and vegetables through the control of evolution.

Perhaps the most convincing evidence I have not even mentioned, and I have left no time to treat it—and that is the fact that evolution is the only philosophy which makes the universe and its phenomena intelligible. It is the master-key that opens the secret vaults of mystery. Before men happened upon this theory of growth and gradual development of everything, the greater part of the phenomena of the universe was unintelligible and inexplicable. It was only when we found that everything had developed from something else that numbers of mysterious things lit up. Everything from distant stars to our social institutions, from oceans to human ideals, fell into one grand and intelligible scheme. Not only does everything become intelligible in the light of evolution, but not a single phenomenon in the universe which does not fit perfectly into the scheme; and the whole thing which previous to the days of Charles Darwin was more or less of a meaningless jumble has been transformed into a masterpiece of beauty and order.

IV

But I have not time to go farther into the matter of proof, because there is an important distinction which I must make before closing the

subject. Awhile ago I said that Darwin accomplished two things in his Origin of Species. He discovered the facts which prove the theory of evolution and gave them to the world in this book; but there is a second thing of equal significance in this book. Not only did he discover these facts which prove evolution; but he worked out a theory which explained how this development took place, which of course was necessary to the establishment of evolution as a tenable hypothesis; and it is perhaps in the discovery of this principle that the real greatness of Darwin consists; for in this does he show real creative genius. It is known as the theory of Natural Selection. Darwin saw that the life of plants and animals tends to multiply much faster than the earth is able to furnish sustenance. This unrestricted multiplication results in a competition for the means of existence. Of the multitude of plants and animals produced, only a few in any generation can survive and reproduce their kind. These few which survive what is a terrific struggle for existence are the ones best adapted to the environment in which they find themselves. So there is a Natural Selection. It is the remorseless struggle for existence which selects the few and lets the many perish; and it is this Natural Selection or Survival of the Fittest, as Herbert Spencer preferred to call it, which explains the process of evolution.

This brings me to a very important distinction between these two matters which lies at the bottom of much of the present attack upon the doc-

trine of evolution and Darwin's theory of it. No man today who knows anything doubts the fact of evolution. Every scientist, who has any standing at all, accepts the doctrine of evolution as the basis of all his thinking; but he may not accept the theory of Natural Selection as an explanation of the fact of evolution. This theory is not universally accepted in toto by scientists. No scientist denies that it is a determining factor in evolution, but that it is the only factor is quite generally disputed. In other words, since Darwin's day new facts have led to new explanations. I have not time to discuss these, but we have today as an explanation of the process of development not only Darwinism, but Weismannism and Mendelism. But what I want you to understand is that scientists make a careful distinction between these two things—the fact of evolution and the theory to explain the fact, and they use the word Evolution to designate the process of development, and they use the word Darwinism to refer to the theory advanced by Darwin to explain these facts. Evolution therefore is one thing and Darwinism an entirely different thing. Darwinism might be totally discarded without touching the fact of evolution at all.

It is this all important distinction between evolution and Darwinism which these Fundamentalists seem to know nothing about. It is for this reason that they talk so glibly about Darwinism being dead and evolution being disproved. In a letter to the *Journal* some time ago, Dr. Riley quoted a large group of scientists as testify-

ing that evolution does not explain the facts of existence. The fact is that these men made those statements about Darwinism, and Dr. Riley not knowing the difference between Darwinism and evolution applied them to evolution. There are many scientists today who say that Darwinism is inadequate or even untrue; but they mean, as every scientist well understands, that the idea of Natural Selection is not satisfactory as an explanation of the process of evolution. Dr. Riley, however, and his kind, in their simplicity or ignorance, at once take it for granted that the scientist in referring to Darwin is talking about evolution and therefore cites this scientist as authority for his declaration that the whole doctrine of evolution has been discredited. What these men are today engaged in is the miserable business of spreading in the public mind misinformation which they ought to be more ashamed of than the so-called monkey origin from which they shrink. It seems to me a much more creditable thing that a man should have arisen from the animal world to the point where he can distinguish between truth and error than to have fallen from a perfect state to the miserable condition of being unable to distinguish between truth and error, while he goes about the country defending the latter in the name of the former.

I doubt, however, if these men were properly instructed as to the distinction between Darwinism and evolution whether they would be willing to abandon the campaign. For, after all, as I showed you last Sunday morning, they hate evo-

lution not because of any false ideas they have about it, but because of the single fact that there is no reconciliation between evolution and orthodox Christianity. They see with perfect clearness that if evolution be true, men must give up the Bible as the infallible word of God, throw overboard the creeds as an accurate statement of human origin and nature, and abandon the church as the appointed medium of salvation. So as I suggested at the beginning, this assault upon the doctrine of evolution by the Christian preachers is merely the most recent engagement in that long warfare between science and theology, and considering the outcome of all the previous battles, we may safely predict the issue here, for as Huxley once said, "Extinguished theologians lie about the cradle of every science, as the strangled serpents beside that of the infant Hercules."

One of the greatest of these battles took place when science declared that the earth revolved about the sun, and history tells us that the only men who knew and had any right to express an opinion upon the matter were, not the priests or bishops chanting their masses and telling their beads in the cathedrals, but the silent watchers of the stars, sitting at their telescopes, whose judgments these priests and bishops ventured to deny. At another period, the only man who knew whether or not the blood circulated through the veins and arteries of the body, was not the churchman who denounced his scientific verdict, but the physician Harvey, who had examined the blood and actually witnessed the pulsation of the

heart. And fifty years ago the one man who knew whether or not evolution was true was not Archbishop Wilberforce, who ridiculed Darwin and his "monkey science," but Charles Darwin himself, who had for twenty years humbly sat as a student at the feet of nature. And likewise the only men who are competent to speak upon evolution today are not these so-called "men of God" who go up and down the land trying to pass legislation to keep the coming generations as ignorant as they are themselves, but the men who have examined the facts as they really are and have dared to follow them; and it is time—after nineteen centuries of humiliation and defeat, that the church should put by its tattered and threadbare garb of infallability, and assume the more modest and becoming robe of the student, willing to learn of those who know. Evolution is today, as I have tried to show you, a truth as clearly demonstrated as the revolution of the earth about the sun or the circulation of the blood; and if the church is not to lose the respect and allegiance of all intelligent men, as it has already lost the respect and allegiance of most of them, it must accept this truth and remake its theology accordingly.

X.

EVOLUTION AND THE SUPERNATURAL

I have more than once referred to the fact that the anti-evolutionists are today engaged in their desperate campaign because the theory of evolution is absolutely destructive of Christian theology—not of religion, mark you, which is a very different thing—but of dogmatic theology. It should be clearly recognized that the most formidable enemy of the creeds of Christian theology is the world-system which science has enabled us to build up, because it removes the foundation upon which the entire theological structure is erected. It is necessary, therefore, for the completion of the argument in favor of a rational as opposed to a dogmatic or emotional attitude toward religion to describe the scientific view of the universe and to treat several of the problems connected with it. I need not go into detail in regard to the view itself since only a few weeks ago I told you the story of evolution, but it will be necessary to give a very general bird's eye view of the way things have grown into their present forms, in order to clear up a few of the problems

which the enemies of evolution still believe to be effective arguments against it, and which still perplex many who have accepted the theory of evolution in a general way—problems bearing upon the relation of evolution to the supernatural. I want above all else to show you that the universe can be accounted for in a purely natural way and that there is no place in the scientific view for the supernatural.

This I believe to be one of the most important problems, because after all the fundamental difference between the orthodox view of the world and the scientific view is that one believes in the supernatural and the other does not. This problem also has an immense bearing upon our practical life. The man who believes in the supernatural lives in an entirely different world from the man who believes in the unwavering processes of nature, and his mode of life will be determined by whether or not he believes in some power greater than nature which can and does interfere with the ordinary affairs of life. Practically all the other differences in belief and in conduct between the orthodox Christian and the scientific rationalist can be reduced to this fundamental problem of the natural and the supernatural.

Until a few years ago, the scientific attitude was very critical and destructive. This negative attitude was most valuable in exposing the unsoundness of the pretensions of supernaturalism and it was absolutely necessary to the building up of a new world-philosophy. It was necessary to clear the brain of all the rubbish of supernatural

religion before a solid structure of rational belief could be built; just as when one has a lot containing an unstable and disreputable building, it is necessary to tear down and remove the shack before he can build the beautiful structure of his imagination. In times gone by, science did little more than remove the old building; it went little farther than to prove that supernatural belief was untenable; but today it is not only able to say with still greater force than before that the old solution of the world's mysteries is wrong, but it is able to put a new and proved solution in its place. The over-whelming evidence which it can bring to the support of that solution establishes it beyond all possibility of doubt. As the dim temples of the old dark faiths decay, the bright temple of the new faith rises to claim its ever increasing multitude of worshippers.

Science has in fact given us a new revelation of the world. The primitive ideas, which are embodied in the Bible and dominated thought a generation ago, were merely random guesses born of ignorance and nurtured in superstition. They were attempted translations of hieroglyphics to which readers had no key. By establishing the truth of the doctrine of evolution, science put into the hands of man the key to the world's cipher. In the light of evolution, dark ways were made bright. Applying the principle to every kind of phenomena, from the making of worlds to the building of religious systems, the crooked ways were made straight. For the stability of the doctrine of evolution does not depend only upon the

vast and increasing amount of evidence which has been brought to its proof; but the soundness of the doctrine is corroborated by the invaluable way in which it unravels those difficulties which were hopeless in former days. There is not a single department of human life—psychology, geology, chemistry, anatomy, astronomy, physics, ethics and religion itself—which has not been transformed and gifted with new life since evolution became the guiding principle. I mention religion principally because the story of evolution has been the greatest aid in tracing what some people still regard as heaven-born intuitions back through successive stages of development to the most primitive sources. The conception which we now have of the origin of the world, of life, and of man—thanks to evolution—is totally different from that which satisfied the minds of men when they were dominated by theology.

There are still, however, several points in regard to evolution which science has not been able to explain, and these points are used by the enemies of evolution as impregnable arguments against its truth. Likewise, many people who accept evolution as a method of development feel that it is impossible to explain these difficult points without introducing the supernatural, which of course does not explain them any better. These points are the origin of matter, the origin of life, and the origin of man.

I

In regard to the first—the origin of matter—of course the old explanation was that of direct creation. Not having been able to conceive of matter existing forever, men introduced a creator who was supposed to have made it, not realizing that it was just as difficult to conceive of a creator who existed forever and was never made. They merely pushed the explanation back one step farther and let it rest there. But this old idea of creation—the making of something out of nothing by an inexplainable something else—has been totally abandoned by the scientific world. In its place we have the principle of the conservation of energy and of matter, based on positive proof that both matter and energy are never destroyed. They are changed from one form into another, but the amount of energy and matter in the universe is the same yesterday, today and forever. I know that wood burns and the result is ashes, smoke and heat; that the ashes are scattered by the wind; that the smoke mounts up and disappears; and that the heat seems to be absorbed by the cold blasts of winter, but not a particle of the wood is annihilated. What takes place is a transformation, a change of form; and the same amount of matter and energy is to be found in the ashes, smoke and heat as was originally contained in the stick of wood. This principle of the conservation of energy and matter itself answers the question as to how matter and energy were made. They were never made. They are eternal. How

do I know? Because they are indestructible and since what cannot be destroyed could not have been created, I infer that there has always been and there always will be the same amount of matter and energy that now exists. So if some one asks me—Who made matter? I answer—Matter. If he does not like my question, I ask him—Who made your creator? He replies—He was never made. I say the same of matter and energy.

According to this principle of the conservation of matter and energy and many of the laws of heat and motion, we are able to understand the process of development through which our world has come. That part of the universe which we call the solar system, our sun with its revolving planets, existed countless ages ago in the form of a nebulous firemist or cloud of star-dust, which no doubt collected as the result of some old disintegrating system, and which the telescope reveals today as the condition of remote stellar bodies. The study of these remote bodies as well as our solar system enables the astronomer to retrace in imagination the steps in the evolution of our solar system from this primaeval mass. This mist or gas began to cool, and as a result of cooling it condensed, and in this process, according to the laws of motion, it began to revolve. This continued until the nebula became a molten mass, and as the rotation became more rapid, it cast off pieces which in the course of ages took on the shapes and conditions of the planets. The positions, rotations and other characteristics of the planets show that they were detached one by one

from the central sun in the process of cooling. When the earth was first hurled off from this central sun, it was a molten mass and as it circled year by year around its source, it cooled gradually until a solid crust was formed upon its surface. This crust was repeatedly broken up by outbursts of internal energy in the form of volcanoes and by contraction in the process of cooling in the form of earthquakes until we get its present uneven surface. And as the temperature decreased, substance after substance was precipitated from this molten mass, water separated itself from solid and air from water; and at this point, as all the signs indicate, life made its appearance upon the globe.

II

Here I pause for considerable discussion because this brings me to our second point—the origin of life, and it is at this point, according to popular impression, that evolution must step aside and let a creative force come into play. The traditional view is that all this cooling was a preparation of the world for the creation of life. The theater was being arranged for living things to play their part and when the stage was all set, some supernatural power produced life. Again let me say that the introduction of such a creator does not explain anything, for you still have left your creator to explain. Whence came he? No, that is only pushing the solution back another step, and is as unscientific as the answer of the

mother, who has neither the ability nor the delicacy to explain to her child the origin of life. The child asks—Mother, who made me? The mother answers—God. The child asks again—But who made God? And the ignorant or impatient mother replies—God was never made. If the child pushes the point still farther, the mother tells it that it is wicked to doubt such things. Now the theologian's answer is similar, and all those who dig beneath the surface in their effort to understand the origin of things are stamped as wicked. But from the scientific point of view, such an intrusion of a creator cannot be permitted. If we are to explain evolution at all, we must accept it as applicable to all cases and at all times. When the conservation of matter and of energy is made the keystone of our world system, the introduction of some new form of either matter or energy is a radical inconsistency. An infinite and eternal universe must contain the potentiality of all things. Our course, it seems to me, lies between abandoning the theory of evolution by scouting the most overwhelming proof, and using it consistently to throw what light it can on the obscure parts of the processes of nature.

A second explanation is that life was imported to our earth from some of the other planets by means of falling meteorites. The objection to this theory is that the extremes of heat and cold through which falling bodies must necessarily pass would destroy all living germs. Life could not very well be a foreign product shipped to our planet over the ocean of ether with its tempera-

ture of absolute zero. Moreover, to say that life was imported from another planet is not explaining its origin. The question: How did life originate on the other planets?—would still have to be answered. The only explanation which comes near meeting all the difficulties is that of the spontaneous generation of life, which is believed by most of the great scientists. Of course, it is only a theory. The difference between the theologian and the scientist is this—while the former excludes every other explanation of the origin of life than that given by his creed, the latter calls his explanation a theory in order that it may not prevent further investigation of the subject, nor deny to people the right to reject it. To my mind, it is the only plausible theory. Perhaps I should explain what we mean by spontaneous generation. Under favorable conditions, the powers inherent in nature manifest themselves spontaneously; that is to say, without any miraculous interference. The snow which falls and covers the ground melts of itself and disappears when sun and wind produce a certain temperature. In the same way, our lakes turn into solid ice by a different combination of sun and wind. This is what we mean by spontaneous change. And the spontaneous generation of life means that at some time as the result of certain conditions which we do not know, inorganic matter turned into organic matter.

When we look closely into the subject, the origin of living matter is not such an abnormal mystery after all. The development of all forms

of life has been traced down to the fundamental living substance called protoplasm. This is the most elementary form of life known. It consists of a single cell and when magnified thousands of times, resembles a drop of jelly, yet it contains all the characteristics of life, such as the ability to absorb food and throw off waste, the sense of touch, and locomotion. All higher forms of life are merely more or less complex combinations of cells of protoplasm. The chemical analysis of this cell of protoplasm shows it to be composed of carbon, hydrogen, nitrogen, oxygen and some sulphur in somewhat more complex combinations than any substance which the chemist is able to produce in the laboratory; but although each of the different elements which compose it is lifeless, and although the nearest approach we can make to it is still non-living matter, it does not follow that any outside or creative principle is involved in the formation. Chemists are familiar with the fact that if a compound is formed of several different elements, it will display properties utterly different from those of any one of the elements composing it, and that the addition of a single atom extra in the combination will produce a radically different compound with entirely different characteristics.

For instance, a drop of water is composed of one part of oxygen and two parts hydrogen, but the properties of water are entirely different from those of either oxygen or hydrogen. Oxygen is the basis of most corrosive acids; hydrogen is entirely different; and yet when these two unite

in proper proportions, the result is water, whose attributes are absent in both oxygen and hydrogen. Oxygen is a fire; water extinguishes fire. Oxygen is a gas; water is a liquid. Oxygen causes thirst and water satisfies thirst. Oxygen, as some one suggests, is a barbarian, but no sooner does it form a partnership with hydrogen than it becomes a gentleman. Now again if one more part of oxygen is added to this combination, making equal parts of oxygen and hydrogen, the result is a powerful bleaching agent, an entirely different thing with none of the properties of water. This is true of every chemical compound, but it is not necessary for me to multiply illustrations since we see every day a hundred different articles of food produced by a combination of elements which separately would neither satisfy hunger nor quench thirst. Just so, under proper conditions, the right proportions of carbon, oxygen, nitrogen, hydrogen and sulphur, each in itself lifeless, in all probability spontaneously generate life. The reason we have not yet been able to produce it is because the proportions of these elements in living substances differ in varying conditions, and we have not yet learned the proper proportions nor the conditions under which they unite in these proportions.

The principal difficulty here is the wide gulf which has been laid down between the living and non-living; but since we have come to a better understanding of matter, the difficulty ceases to be impressive. Matter used to be thought of as simply dead inert stuff; but we now know that

the simplest atom of matter is a system of revolving electrons so complex as to dazzle thought; that the various atoms represent elements with an extraordinary diversity of properties; that every atom is athrill with energy or force. And these things lead me to suspect, if not to believe, that the distinction which we make between organic and inorganic, between living and non-living bodies, is a difference of degree rather than a difference of kind. Think, for instance, of the relation between chemical affinity and sex. Even as we see living beings unite to produce new life, so lifeless elements of matter are drawn together by the law of affinity, and of their union is produced life. It has been fully demonstrated that non-living things are attracted and repelled by their environment as well as by the influence which they exert upon one another. That almost justifies us in saying that there are no non-living beings. To attract, to repel is to respond to another's call. Is not that life? The sympathies and antipathies of inorganic bodies are at least the promise or starting point of life. What Goethe calls the law of affinity is very interesting. Just as human beings have their likes and dislikes, so have acids, gases and metals. The prejudices of liquids and of solids are as pronounced, if not as capricious, as those of races and religions. The chemist knows very well that there are friendly and hostile gases and acids; some blend cheerfully, even seeking one another in order to unite; others are so averse to each other that no power on earth can force them to-

gether. Now all this we cannot deny because we see it taking place in our laboratories every day; and yet if we admit that non-living things seek each other or avoid each other, we have practically subscribed to the doctrine that by their coming together they become parents and produce a new and different thing. This law of affinity is what a little later develops into sex; for fundamentally love is a chemical attraction. And so I believe that under proper conditions, chemical elements can unite to form life just as naturally and as spontaneously as snow melts of itself when sun and wind produce a certain temperature, or as water turns to ice with a different combination of sun and wind.

Therefore, I would have you remember there is no need of a supernatural creation of life in order to make the doctrine of evolution acceptable. There is nothing more mysterious about the formation of this elementary form of life which we call protoplasm from a certain group of elements than there is about the formation of water from the combination of hydrogen and oxygen in proportions of two to one; and every form of life today is merely a more or less complex combination of multitudes of cells of protoplasm which have built themselves upon one another and arranged themselves in various forms, much as the island is built up by the combinations of the little coral polyps. Besides, to the logical evolutionist, who traces a continuous chain of cause and effect back into the past and forward into the future, such an intervention is a contradiction of the

fundamental principle upon which all knowledge is based—the uniformity and constancy of nature.

From here on for a time, the ordinary person finds little difficulty in accepting the natural processes of evolution. From this little cell of protoplasm about which we have been speaking, which reproduced itself by division into two cells, there grew organisms formed of groups of cells, and as these developed, they became more and more different in character and in function. No supernatural power, no agency other than that of natural selection was required to bring about that slow unfolding of complex forms of life from the simple cell. At a very early stage of this development, there is a division into two branches, one of which leads to the animal forms of life and the other to the vegetable forms. On the vegetable side, we can trace the development of fungus-like growths into mosses, through ferns and other types to the most highly organized trees and plants to be found in the world today. On the animal side, there has been greater diversity and the type of life ultimately evolved is much higher. The difference seems to have been due to the development on the part of animals of a nerve structure. These lowest forms of life in the single cell respond to a sense of touch all over their surface. At a later stage, some parts of their surface become more sensitive than others, and rudimentary nerve tracts are formed. By a continuation of the same process of development, the nerve system as we know it, in the fully developed animal, was ultimately produced. In fact, science is able

to trace the highly organized sense organs, such as the eye and ear, down through a continuous chain of stages to what may be called in the simplest form of life the "protoplasmic sense of touch."

III

Now I have no desire to repeat the story of animal evolution related for you several weeks ago. Suffice it to say that from fossil remains which are found in the rocks we are able to reach the whole development from the simplest form through mollusc, fish, amphibian, reptile, mammal, to man. But when we come to man, we stir up again the dust of an old controversy. But in spite of all the ignorant denunciation by the clergy, it is now recognized that the arguments which Darwin, Huxley, Haeckle and others produced in proof of the evolution of man from an ape-like ancestor are impregnable. The study of embryology, anatomy, and palaeontology show beyond dispute that man bears in every nerve, bone and fibre the stamp of his animal origin. But even some who admit this insist that because of man's unusual mental superiority over the animal, it is here necessary to introduce some supernatural power to explain this difference. In this case again, as in the problem of the origin of life, they exaggerate the gulf over which supernatural forces alone were supposed to be able to leap. The difference in structure and in mental power between the higher apes and primitive

man is less than that between primitive man and civilized man. Yet people who are willing to grant that the savage might develop naturally through slow stages to the level of civilized man refuse to admit the less fomidable probability that the savage had an animal ancestor.

The real reason why so many people are unwilling to give up the supernatural theory of life is that they feel compelled to regard the human mind as an achievement quite beyond the range of nature. Admitting the continuity of evolution from primitive organisms up to man, the orthodox notion of the human mind as something different, becomes much easier to explain by means of supernatural methods. It gives a kind of distinction to man, which he enjoys. The whole matter after all is largely the result of human conceit, and the old superstition that the universe and all that is in it was made for the pleasure and benefit of man. And this old "lord of creation" idea persists, as does the belief that the development of human character is the purpose of the universe. Of course, it is impossible to disprove this belief because we can do no more than speculate in the vaguest manner about the existence of a purpose in a solar system or a universe. But if any one should ask me what is the purpose of existence, I should have to reply frankly, "I have not the faintest idea." No one has ever really got beyond that negative position; but the more we know of the universe and of man's place

in it, the less confident we become in our natural feeling that everything was made for man.

In any case, no supernatural power is necessary to explain this supposed gulf. The theologian here again is creating his own puzzle by taking an extreme case on one side of the gulf and contrasting it with an extreme case on the other side. If we take the lowest type of human being and compare it with the highest type of animal, there is not very much difference between their respective mental equipments. Comparative psychology shows that there is no radical difference between the mental activity of an animal and that of a man. The one is a more highly developed form of the other. Further, it proves that mental power is conditioned by the complex structure of the brain, and that the human brain is different from that of the highest animals only in the complexity of its structure. It is just as easy to believe that the human mind has grown out of the high form of animal mind as to believe that the animal mind could develop from the simple irritability of protoplasm. I need not trace here the steps which brought about this remarkable development. In the great struggle for existence, the very defects of the ape-like body necessitated the sharpening of the intelligence, which resulted in the development of means of communication or language, the development of the hands and the use of implements, the discovery of fire and the invention of tools, from which point it is comparatively easy for the anthropologist and the psychologist to show every step man

has taken from his simple primitive life in the jungle to the complex civilization of our modern cities.

IV.

I want rather to turn to the establishment of the moral law and the development of conscience. This is the fourth and last point at which men have argued the necessity of supernatural intervention. But here again the development of codes of ethics and conscience is just as natural as the development of the physical frame. I want to emphasize this point because it has a direct bearing upon what one may call the practical side of religion, and every Sunday morning address should have such a bearing. According to orthodox beliefs, the moral law was derived from the announcements of God and confirmed by the voice of a divinely implanted conscience. But now we have learned that the moral law has a purely human source, and that conscience itself is a product of evolution, varying in time and place in a way impossible to a thing of divine origin. We know now that the moral law is simply the result of the experience and traditions of society. Animal groups have their moral codes, in which fidelity, courage, mutual assistance, paternal love, faithfulness in sex relations, self-sacrifice and other high qualities have been revealed. The evolution of morality is best understood by the fact that the possession of one or more of these qualities enabled them to survive in the struggle for exis-

tence. Both in human and animal societies, certain lines of conduct tend to the welfare of the society, with the result that those communities possessing them in the highest degree continue to exist, while those which do not possess them are unable to continue in the fierce struggle. And on this basis of cause and effect, the slow development of morality from the first congregation of animals into herds to the most elaborate codes of the modern world can be explained.

At each point in the progress, the code of conduct accepted was a reflection of the condition of that society. The whole of history shows how mankind has learned by slow and painful degrees in the school of experience what modes of conduct were most beneficial. The lesson is still unfinished, since each advance in civilization alters the moral environment and demands a new adjustment on the part of individuals and of nations. There is no better illustration of this fact in all history than the way in which the very fundamental principles of international law concerning the rules of warfare underwent a change during the last war as a result of the invention of submarines, aeroplanes and poison gas. It is this continued effort on the part of man to adjust himself to his environment that constitutes the mainspring of social and moral progress. This gives man a real and immediate reason why he should be good because it introduces the idea of cause and effect into the moral sphere. It proves that actions and their results are bound together by an unbreakable chain of cause and effect.

There is no need to create a heaven to reward virtue nor a hell to punish vice, since these have their inevitable results. Not all the forces on earth can prevent a bad action having bad consequences, nor a good action being blessed with good results. That which a man sows he shall also reap, not because God said so, but because effect follows cause as surely in the moral world as in the natural world. Neither prayers nor repentance nor forgiveness can wash out the results of our wrong-doing; it can be atoned for only by good actions which may compensate for the injury done.

I wish to stress this point particularly because we are told that our system of philosophy results in moral laxity. But when we speak of this iron law of retribution, whose action is seen in every event in the moral world, how can any one accuse us of encouraging moral laxity? The greatest stimulant to moral laxity that I know of is to teach that there is a God who will pardon man's worst sins, that there is a savior who has sacrificed himself upon the cross that the effects of sin might be cancelled, and that in order to escape the consequences of sin all one needs is to accept Jesus Christ who took upon himself the iniquity of the world. Evolution teaches that evil conduct cannot have its effects erased by an act of grace and so cannot be accused of throwing open the gates of moral laxity. Grave moral danger lurks in the idea that sin may be wiped out by belief in certain dogmas, and the whole of the Christian church encourages believers to think that their

sins will be forgiven by the asking. This is a vain hope and it is a hope that stifles the voice of conscience. In whom is the sense of moral duty likely to be more keen: the man who thinks that an act of faith will give him a fresh start with a clean slate, or the man who knows that every act is followed by its inevitable result and that good alone can cast out evil?

Now I think enough has been said to indicate that science gives a connected and reasoned explanation of the process by which the earth with its multitudes of forms of life evolved from a primæval nebula. On the face of it, such an explanation is radically different from that associated with the accepted form of belief. There is no place in it for supernatural agencies. There is nothing but a slow unfolding of diverse and more diverse forms of substance and life in fulfilment of some great energy according to natural law.

At the end I would like you to note the hopefulness of such a view of life. As one looks back over the slow development from the primitive to the civilized man, he cannot help being impressed with the intellectual and moral advance which has been made. Likewise he cannot help being impressed with the possibility of the continuation of that development to still higher levels. Rightly read, that story is far more inspiring than any conception of supernaturalism. It proves the reality of progress — progress which each generation inherits from its predecessor, carries a step farther and hands down in its improved

form to its successor. In short, man is still evolving, and no one who keeps in mind the wonderful past of the human race will venture to set limits to the degree of development which he may yet attain.

There is one thing more I must mention at the close. I am sure some of you are wondering what I think of the nature of that reality underlying this whole thing — what is that great force back of or in all existence? I must answer as in the case of the purpose of the universe, "I have not the faintest idea." That is the great Unknown. Men may say they know this or that about it but men who are honest and humble can only confess their ignorance because there are no means of obtaining any evidence whatever on the subject. Men may speculate about it as they please, but the very nature of thought prevents these imaginings from being any more than mere phantoms of the mind. The honest mind leaves all such problems to the realm of speculation. There is no use crying for the moon, or consoling yourself with the thought that it is within your grasp. So there is no use crying after this unknown force, or consoling yourself by thinking you know what it is when you do not.

The world of facts holds far more marvels than were ever dreamt of in philosophy, and the progress of science opens up wider and wider horizons of phenomena to be discovered and investigated. I feel that my most important work is not to speculate about the Unknown, but rather to turn the thoughts of men from such idle specu-

lation to the rich universe that lies around them, and of which they themselves are the most interesting and marvelous product, and to help them realize that the destiny of humanity rests in their hands; for once we turn men's hands from supplication to the tasks which lie before them, and inspire in them a firm and confident reliance, not upon some supernatural aid, but upon themselves, in whom lies the possibility of all things, the welfare of humanity is assured.

XI.

EVOLUTION AND CHRISTIANITY

A few weeks ago the *Nation* had as its front page headline, "Religion Becomes News" with a subtitle, "Americans are asking themselves for the first time in their lives, 'just exactly what do I believe?' " And this statement carries a great deal of truth. A few years ago one could not have imagined the American public reading column after column of religious controversy, and yet during the past few months, banditing and murdering, bootlegging and divorcing have all been relegated to the remote inner pages, while people have devoured hundreds of front page articles dealing with religious problems. And we are told that in this age of pitiless publicity, the public interest in any matter may be gauged by the amount of space devoted to it in the newspapers. If this be true, the public agitation over the present religious situation is phenomenal. All America seems to be profoundly stirred, or more than usually flippant as the case may be, and the publicity which certain leaders on both sides of the controversy have received during the last two

months has exceeded even that of certain well-known exponents of the pugilistic game.

While this whole matter has been gaining more or less momentum for several years, ever since the organization of the Fundamentalist movement for the suppression of the teaching of evolution, it was of course brought to a climax this summer by the trial of Mr. Scopes for the violation of a Tennessee law forbidding the teaching of the theory of evolution in the public schools. I have neither the time nor the inclination to review the progress of this trial, nor to comment upon it; but it is believed by many people that in that little town of Tennessee, among those few thousand farmers, there opened the first stage of what may prove to be the greatest intellectual battle of modern times. The fact is that at Dayton was fired the first shot in what a distinguished American rationalist described to me this summer as the greatest struggle between naturalism and supernaturalism that the world has yet seen. I confess that it has not appealed to me as important as all that, but I am beginning to realize that I have hitherto underestimated its significance. Heretofore I have thought of it only as an incident which really meant progress, that at last modern ideas were reaching the sleepy rural districts, and there was a natural reaction. I still believe that in one sense this is true; but to believe that it is the whole truth, and to see only the humorous side of this conflict between pious superstition and scientific rationalism, is too much like playing the

fiddle while Rome is burning; and the lesson may be severe when we learn it.

Of course my original estimate was based upon conditions in Tennessee, the population of which is composed largely of people who are Baptists and Methodists, and as some other one has put it, whose minds have been poisoned by long years of moonshine and revival meetings. Twelve counties in Tennessee have no railroads. The man who drafted the bill against evolution attended school only twenty-one months during his whole career and his wife confessed that she had never been away from home. The county in which they live has fifteen thousand inhabitants, of whom thirteen pay income tax. Its white illiterates number twenty-five per cent. Three-fourths of its schools consist of only one room; half of its teachers themselves have had only an elementary education and are paid four hundred dollars a year; and the children attend school one day in three for the year. "Revivals whip up the country every few months, and the most blatant and ignorant preachers find it a paradise."

But we must not mistake the significance of the fight. The trial in Dayton is over and by many forgotten. Mr. Scopes, of course, was convicted and fined. But that is not important; it is the appeal to a federal court that is important. The question will then be raised whether a state in the American union can pass a law forbidding the teaching of evolution in its schools. Over that issue there will be a tremendous conflict, and it is here that you realize the seriousness of the sit-

uation. The whole Fundamentalist movement, that is orthodox Christianity, is aflame against science; and it is a movement of prodigious power. There are bills similar to that in Tennessee pending in a dozen different states and these people threaten to carry the fight into every state in the union. Kentucky recently escaped such a law by only one vote. Florida has forbidden the employment of teachers who mention evolution. Texas has forbidden the employment of so-called irreligious teachers. In California, which seethes with the confiict, the board of education has received a petition from the anti-evolutionists. In a Kansas district, the voters recently raided a school and burned all the science manuals. Even here in Minneapolis, the school board has been prevailed upon to permit religious education during school hours and to give regular credits for the same. The Fundamentalist leaders, like Mr. Riley, insist that they are going to carry the campaign into every state in the union, and that there will be no stopping them until evolution, "that lie of hell," is never mentioned in tax-supported schools.

Well, where will it end? I do not know—the issue is by no means certain. On the one hand the more or less indifferent liberals, who have for years deprecated all mention of religion, who felt that it was enough to undermine superstition, who called the kind of work we do here destructive and dangerous, are slowly being aroused. People are reading about science and evolution as they have never read before. Even the judge

in the Dayton trial has promised to read Darwin's "Origin of Species." A Science League has been formed which is fighting nobly, and there is now being organized a League of Freethinkers for the defense of academic freedom. But the magnitude of the danger must not be forgotten. The Fundamentalists—Baptists, Methodists, Presbyterians, and so forth, who cling to sixteenth century theology—are a powerful force; so powerful that the politicians, who make our laws, dare not thwart them. Suppose they carry state after state, and reach congress, what would happen? Again I do not know, but it is well to remember that of the four hundred and thirty-five congressmen, about four hundred belong to evangelical Christian churches. There are ninety Methodists, sixty-eight Presbyterians, fifty-two Baptists, and so forth. In the Senate, it is much the same; all but ten belong to some orthodox religious sect. When you add to this the fact that the newspapers also are afraid to speak against the wishes of this powerful group you realize something of the danger threatening. Let me read you an editorial from the *Minneapolis Journal,* dated July 22, 1925, and entitled, "The Tennessee Law Is Sound." It reads: "We consider the Tennessee law forbidding the teaching of evolution in the schools a sound law. Certainly if the Bible cannot be read, evolution should not be taught in the schools, because it is bound closely to the Bible by its reverse teaching. The Bible declares that God created the earth and the heaven and all that in them is. Therefore, to teach evolution and not

to teach the scriptures is as inconsistent as it would be to teach the scriptures in the schools. No one ever advocated teaching the scriptures in the schools; therefore, no one should teach evolution in the schools. We hope the courts will sustain the Tennessee law. It is sound to the core." I have no time now to comment upon the ridiculousness of that editorial, but it suggests a dangerous possibility. It is just possible that in the next generation the orthodox Christian church may have such a strangle hold upon our people that it will be necessary to raise the old war cry of Voltaire, "Ecrasez l'Infame"—"Crush the Monster."

I

In view of this matter, it has seemed well for me to open the work of this new year by outlining for you as simply as I can the issue involved in this struggle. And especially do I feel that this is important in view of the fact that the problem is hopelessly muddled by the attitude of millions of people who ought to know better—I refer to those people who are constantly trying to smooth over the difficulty, who tell us that there is no conflict between Christianity and evolution, that the Bible is not intended to teach science, that it is a book of religion—who use "mealy-mouthed" words to give the impression that they are both orthodox Christians and evolutionists. This I regret to say was the attitude of the defense in the Dayton trial. They tried to introduce wit-

nesses to show that there is no real conflict between the Bible and the theory of evolution, which to my mind is arrant nonsense. Of course, there is no conflict between the doctrine of evolution and the teachings of the Bible, if you recognize the Bible for what it is—a collection of ancient Hebrew literature of several thousand years ago, which is not supposed to know any more about the origin and nature of the universe than any other literature of that period; but no orthodox Christian, or any other kind of Christian, is ready to do that for a single moment. This again is the attitude of the press, as witness an editorial in the *St. Paul Pioneer Press* of July 13, 1926: "It is a great mistake to raise in the public mind an issue as respects Christianity and evolution. Many people in the world accept evolution as an explanation of the origin and development of the species, who also are very earnest Christians. They have no difficulty in reconciling the Darwinian hypothesis with Christianity. It is thus possible for many earnest Christians to be on both sides." The great trouble here is that people identify Christianity with religion, and cannot understand how there can be a religion which is not Christianity. They are so afraid of dropping the word Christian that they would rather distort Christianity into some unrecognizable deformity than frankly to admit the conflict, lay aside their Christianity, and construct for themselves a religion that conforms to the facts of experience.

Of course, there is no conflict between relig-

ion, when recognized as a biological factor in human life, and evolution; but I insist that there is an irreconcilable conflict between evolution and certain types of religion, as for instance between evolution and orthodox Christianity, and orthodox Christianity is the only kind that really exists; when Christianity is no longer orthodox, it is something else, and should frankly admit it. Evolution and Christianity are the result of two entirely different methods of investigation, which are known as the scientific and the traditional. Men who use the scientific method of investigation have come to certain conclusions in regard to the origin and nature of the universe — the facts which they have observed and verified have driven them to make certain definite deductions which have resulted in a theory known as evolution. On the other hand, Christianity, by the use of an entirely different method, founded upon faith rather than upon science, teaches a wholly different theory in regard to the origin and nature of the universe and of man, which Jonathan Edwards called the theory of redemption. And between this theory of evolution, which is today held by all those who use the scientific method, that is, by the scientific world, and the theory of redemption, which is today held by those who base their knowledge upon faith, that is, the orthodox Christian world, there is an irrepressible conflict. The earnest world is getting tired of this business of reconciliation. I believe it is every man's business either to adopt the scientific method and then follow it to whatever conclusions

it may lead him, or else throw himself back into the arms of faith and accept whatever conclusions are told him. That to my mind is the great alternative; and therefore, I propose this morning to outline for you as simply and as clearly as I can these two world theories and then suggest to you what seems to me to be the inevitable choice —not a patch work of the two; we must choose either the one or the other in its simplicity and entirety. I shall not tell you anything new, but I desire to refresh your minds with what you are perfectly familiar. Let me first state that the theory of redemption, which underlies every one of the great churches of Christendom, constitutes the frame work of all Christian theology, and forms the foundation of all the Christian creeds as they have existed in the past and as they exist today.

II

According to this theory, God, who in the form of a person, has existed throughout all eternity, created the world suddenly a few thousand years ago. This world included all varieties of vegetables and animals, and two people—Adam and Eve. These two people were placed in a garden, which contained everything that they could desire, and everything was for their use, except the fruit of one tree—the tree of knowledge—they were not to get knowledge. This world was in existence only a short time when Satan appeared upon the scene. Satan is at the head of

the kingdom of evil, which he founded after a quarrel with God ages before, and which is in opposition to all the activities of God. In this instance, he assumes the form of a serpent, and in an upright position appears to Eve and talks with her. She listens to his seductive conversation, and as a result of it, she believes what he has said and eats an apple from this tree—the fruit of which had been forbidden by God. As a result of this, not only are Adam and Eve cast out of the Garden of Happiness, but all of their descendants throughout all time, which means all the people who ever have lived or ever will live in the world, are not only subject to disease and death, but they become in a way that it is impossible for our present day ethics to conceive—guilty.

Mark now, that the first point in the history of the world after the creation is this incident of disobedience which is known as the "fall of man," because this is the cornerstone upon which the whole scheme of salvation is built. After this, God appears upon the scene. He walks in the garden with Adam and Eve, talks with them, and gives some vague and indefinite promise about the future. Then some years later when the earth has become peopled, he chooses from all the people of the earth a small group of peculiar people, hoping through them to save the race. And with this people God keeps in touch from time to time. As the years go by, occasionally an angel is sent to one of them with a message. Later, God is supposed to have inspired certain men to

deliver his message. Some of these messages were written down, some were not. At last the messages which were written were collected in a book and the Old Testament came into existence; and this became a sacred book to these people, containing the messages from God, telling them how to worship and how to conduct themselves toward their fellows. Shortly after that, the second act in the great world drama begins.

A little babe is born, and it turns out that he is miraculously conceived, and later the church learns that this little babe was the Almighty God of the universe himself in disguise; that he came down and assumed the form of man, lived for a little over thirty years, taught, suffered, died on the cross, went down to hell, escaped from the clutches of the Devil, then arose from the dead, and ascended into heaven, wearing the very body that he had on the cross. And all this was done in order to make it possible for God to forgive men and to save the race from the results of the "Fall." This is known as the atonement, brought about by the death of God himself on behalf of man. Thereby, we are told God's justice is satisfied. How? By somebody suffering instead of the sinner so that he can be treated as good in spite of the fact that he is not good. This closes the second act in the world drama of redemption.

There is a third act which includes all the time since then. During all this time, God is supposed to have been engaged in doing all he could to save men. The church has been organized and the Holy Ghost has been at work for nearly two

thousand years, trying to convert people; and we are to understand, and this point I wish to emphasize, that those who believe this story and accept this suffering on the part of Jesus will be taken after death to a beautiful city of eternal happiness, and that all the people from the beginning of the world down to this present time, who have not accepted this one atonement, either because they refused to believe it or because they have never heard of it, have gone down to an endless hell. Thousands and thousands at this very moment are plunging over the abyss into this eternal ruin because they have not accepted or have not heard of this one only condition of salvation. Now, this, somewhat baldly stated, is the outline of human history according to what has come to be called orthodox Christianity. There are many variations of orthodoxy, but these great central doctrines are changelessly taught by all, and insisted upon by these Fundamentalists.

Now let me briefly ask if there are any reasons for supposing that this theory is true? Is there any reason for believing the story of the Garden of Eden, and the incidents in connection with it, as well as the horrible results of these incidents. Every one who has studied the facts knows there is no more reason for believing the story of the Garden of Eden than for believing the story of the Garden of Hesperides, the story of the Golden Fleece, or the Golden Age of Italy when Saturn was thought to have lived among men, or any other mythological story. In fact, we know today that it is a Persian fable bor-

rowed by the Jews during their captivity and incorporated into their religious literature; and there is not one particle of evidence on which to rest it. The same thing is true of the belief that God came down and became incarnate in a man, suffered, died and went to hell to save men. This was not generally believed until several centuries later. It is philosophical speculation pure and simple—the result of the fusion of Pauline theology with Greek mythology. And the story of his birth upon which it is based also grew up considerably later, in the same manner in which like legends wove themselves about the births of all great religious and political leaders of that time. You need only study comparative mythology to know that practically the same stories are attributed to various men; and there is no more reason to believe that Jesus was born of a virgin than that Gautama Buddha or Alexander the Great or Apollo was— the same stories are told of them. And, of course, I need not comment upon that hideous doctrine of an everlasting hell as the thing from which men need to be saved. It is nothing more nor less than the product of the imaginative horrors and cruelties of uncivilized and barbarous men. In fact, there is no rational ground for the acceptance of any of these things as true. The advocates of this system have never attempted to prove it; they merely ask you to believe it and console yourself by thinking that it is beyond the understanding of mere finite man.

III

Turn with me now and note the other theory. And this theory, let me say, is absolutely demonstrated to be true; and not wishing you to take my word for this statement, I am going to spend next Sunday morning in presenting you with an array of evidence that ought to convince even a Fundamentalist.

I need not speak to you of the far off origin of the solar system from stardust and nebula, as a result of the working of natural conditions upon ever-existent force and matter. I need not speak of the cooling of our planet until it had formed a solid crust, nor of the appearance of vegetable life, followed by animal life. I need not speak of the progressive development of this life into higher and higher forms until at last it reached the stature of man; but let me speak of man who has been on this planet for several hundred thousand years at the very least. There never has been any Garden of Eden, or perfect condition in the past, there never has been any fall, there has been a constant rise. Man has been climbing slowly up the ages from the most primitive condition to the present civilization. There was a time when he was without the knowledge of fire, when he had no weapons or implements of any kind, except perhaps a limb torn from a tree. Later he began to break the rocks into shapes of use, making arrow heads and hatchets and spears. With these tools he began to dig out logs and make boats out of them. Then he discovered a

method by which he could kindle a fire, and he smelted ores with which he made better implements, and invented the manufacture of rude kinds of pottery.

By and by, speech, partly an inheritance and partly an invention, widened its range and he learned to write in some crude fashion. Later he invented an alphabet and then he began to be civilized. He could now keep a record of the past so that the human race began to have a memory, and comparing its conditions with those of the past, it could forecast and trace out the steps of its advance. Then rude songs began to be sung and there was the beginning of a literature, and later metals of one kind and another came into use. Then some man invented moveable type, and the modern world with its literature became a possibility. And all this time from the beginning men were learning the rudiments of morals. For what are morals? Morals are nothing more or less than the rules wrought out as the result of human experience by means of which people are able to live together. Men have learned what is right and wrong in their relation to one another just as they have learned what is poison and what is healthful to eat—by experience. There is no need of a supernatural revelation to tell men that they must not kill. If people are to own anything, stealing must not be permitted. So every one of the principles of ethics has been wrought out naturally as the result of human experience.

And all this while men have been learning to

care for the beautiful. From the first rude sketches on the wall of a cave, men have developed the finest artistic productions of painting and sculpture; and out of the crude noises and the sense of rhythm has come all the music of the world, until at last we have the great symphonies and oratorios and operas of the masters. Likewise man has developed as a religious creature. From the first fear of the natural powers and his desire to escape their wrath have grown all the religious systems of the world, until man has come to feel himself akin to the life and power of the universe. So step by step up the ages man has marched toward a higher civilization. This is the way the world has grown into its present shape; and we are still only in the beginning of our long march. Man is not yet really civilized. It is only the dawn. The sun's rays are striking here and there upon the hill-tops, the light is breaking on some of the plateaus, but the great lowlands are still filled with the blackness of night, the awful darkness which precedes the dawn. The midday, when the sun's rays will penetrate into the deepest valleys and flood the whole earth with light, lies far beyond.

IV

Here then are the two theories. If man did not fall at the outset of human history, then there is no reason for the existence of a single one of the doctrines of the orthodox plan of salvation. They are entirely out of order, because they are

not called for by the facts. They are not needed for any service today. They only stand in the way of the acceptance and the recognition of the real condition of the race, and the application of the real remedies. And the fact that these two theories are now struggling for existence is the explanation of what is going on in the religious world in this twentieth century. Here is this irrepressible conflict between these two world theories. One of them must be accepted. They are mutually exclusive. They cannot live together. And it is this fact that has aroused the Fundamentalists. They know perfectly well that there can be no reconciliation between evolution and orthodox Christian theology. Between this Christian scheme of salvation and this fact of evolution, there is utter incompatibility — and these people know it. They see with perfect clearness that if evolution is accepted as true, the fall of man immediately disappears and with it goes the whole structure that is built upon it.

This does not mean, of course, that the acceptance of evolution is inconsistent with religion, or even with the ideas that are central to religion. For instance, the late Mr. Bryan proclaimed that evolution and atheism are synonymous. Of course, if atheism means a denial of Mr. Bryan's God, then that is true; but if Mr. Bryan does not have a monopoly upon the meaning of the word God, then it is not true. Among all the classic evolutionists, whose labors established the doctrine in the minds of men, I know of not a single one who was an athetist. Many of them were

agnostics in the high and reverent sense that they were unwilling to affirm that they knew everything that might be known about God and the world; but such confession of ignorance is a very different thing from out and out denial. And when religion is understood to be, what it really is, a natural factor in man's age-long attempt to adjust himself psychically and socially to the world in which he lives, then evolution adds to, rather than takes from, its meaning and its value. What must go in the face of this great discovery is not religion, but Christian orthodoxy with its dogmas of the fall of man, the divinity of Jesus, the atonement, and all the rest. It is these discredited doctrines, born of an age of ignorance and superstition, and not religion at all, that the Fundamentalists are really interested in. And it is not only because they fear, but know, that this whole structure is being shaken to the ground by evolution, that they are today entering upon their desperate campaign to save the world from this so-called false doctrine of evolution which is undermining the Christian faith. This they have a perfect right to do; but the rest of us have an equal right to try to save the world by discrediting forever an interpretation of the universe which is attested untrue and immoral; and which we believe stands in the way of the real salvation of the world.

For just as surely as they are convinced that the world needs to be saved from the doctrines of evolution, so surely am I convinced that the world needs to be saved above all else from Christian

orthodoxy, which has fought tooth and nail every step of advance and progress. You know this as well as I do. The facts look out of myriad pages of history and make up many of its blackest infamies. If you do not know it, then read the stories of civilization as told by Draper, by Lecky, by White, by many others. Which of its prophets has not the church persecuted? What new truth has the church not opposed? What mental or moral or social or political progress has the church not protested against? And what tyranny and oppression has the church not supported? If the church could have had its ways, modern civilization never could have developed and humanity would have been ruined. We should still be living in filth and squalor and superstition and intellectual abjectness of every kind. It is in spite of the Christian church that civilization has advanced and that some of the real evils have been overcome. Only the irresistible impulse of human nature, reaching out after the good and the true, has saved humanity from destruction by the ecclesiastical organization. Her restraint has placed a premium upon a shackled mind, the result of which is ignorance. Because of her method it naturally follows that the most ignorant will always be the most orthodox. In fact, all that is needed to be orthodox is a competent and active ignorance and a belligerent conceit. With this furnishing, they can throw out to their own satisfaction all modern science, modern sociology, modern political economy, and all the modern methods of dealing with the great

evils of the world and continue to salve their consciences by persuading themselves that they are rescuing souls from eternal fire. This is why, above all else, we need to be saved from that scheme of things which starts with the fall, with an atonement wrought out by a dying god midway, and an eternal hell at the end. We need to be saved from that overshadowing hideous nightmare of barbarism, in order that the people of the world may unite to wipe off the face of the earth the real evils that threaten and crush the life out of it now. I believe that all the really civilized people, no matter of what race or creed, who believe in justice and right and truth, should unite to save the world from the false traditions and theories which breed horror and lead us astray, so that we may address ourselves to the real causes of human sorrow and human pain, that we may develop within ourselves the forces which make for a better and higher civilization.

What we need really is to train and educate men by means of the scientific method, educate them intellectually, morally, spiritually; teach them what is true—that the only real good and happiness are to be found by complying with the conditions of human life. That is what we must teach the world if we would save it. Let men be free, let them dare to study, let them know that all problems can be solved and that it is their business to solve them; let this great hope enter into their hearts, let them combine to this end, and the world can be saved. And just in so far as we succeed in solving more and more problems,

the old evils will be outgrown and left behind. The "low sad music of humanity" will sink down and down the past, to be succeeded by the swelling song of gladness, of cheer and of hope.

XII.

EVOLUTION AND PROGRESS

No question has been so much to the front during the last decade as the question of progress. It has been discussed on every hand. We find books written on it by learned philosophers and magazine articles by popular writers. And I think there is no more interesting or important problem than this problem of progress. Of course, in a sense, this discussion is a revival of the same old question of whether the world is getting better or worse, except that it goes a little deeper than mere surface evidence, and gives us something of a shock because we have not heard much of that question for a number of years. In fact, we have been living in an age that has made a god of progress, that has accepted a false interpretation of evolution as its predominating philosophy, and has believed in the infinite capacities of education. This question was revived because of the apparent recurrence to barbarism on the part of the human race a few years ago, and the chaotic condition which has followed the destructive forces of the great war. Since 1914, men

are not able to confront the conditions and facts of life and have the same unqualified faith in human progress as they had a few years ago. Immediately following the war, there seemed to be a definite reaction against the idea of progress —today there seems to be a revival of belief in the idea. Some of you will remember that seven years ago I reviewed two books on this subject, both called "The Idea of Progress"—one by Professor Bury of Cambridge University and the other by Dean Inge of St. Paul's cathedral, London. The former was a history of the idea of progress and of the part it has played in the philosophy of the last century, the latter was a critical discussion of post-war conditions as compared with those of previous times for the purpose of ascertaining whether or not we can believe in progress. While both of them approached the subject in a different manner, the tendency of both was skeptical; that is, to disbelieve in the idea of progress as a fundamental principle of the universe. Since then the discussion has been going on, and today we find many people taking the other side of the question and trying to prove that real progress has been made. Among these are a book and a magazine article which have appeared recently and which have suggested this subject for discussion this morning. The book to which I refer is by Joseph McCabe, with whom you are all familiar, and is called "A Century of Stupendous Progress," and the magazine article, entitled "Is Progress a Delusion?" is to be found in the November issue

of Harper's by Will Durant, the author of the best selling non-fiction book of last year, "The Story of Philosophy." Both of these seek to show that we have really made progress, and I shall refer to their arguments in a few moments.

I

But before I do that, I want to give you as briefly as I can a synopsis of the history of the idea of progress—not because it helps to establish either the reality or the illusion of progress, but because it is interesting. You may not realize that the idea of human progress is a comparatively modern doctrine. The ancient world knew nothing about it. To the Greeks and to the Hebrews and to all the ancient civilizations, the golden age of human happiness lay far behind them in the early dawn of existence, and from that blissful state man had subsequently fallen away. It was almost universally believed in these ancient times—and this belief is carried over into modern times—that man fell from his original perfect state and has constantly deteriorated and would grow worse and worse until he faced utter ruin and collapse, when God would intervene and restore humanity to its early state; and the increase of happiness that was to come would come suddenly as a result of the efforts of God. During the middle ages in the Christian world, this same idea prevailed. The world was entirely corrupt and was hastening on to its ruin; and the purpose of the church was to save the few

elect souls that had been predestined to be saved and get them safely to some distant heaven before the catastrophe came. The prevailing thought of this period had no idea whatever of human progress on this planet; it had no thought of transforming society or even of bettering social conditions. The world was hopelessly corrupt and was rushing on toward complete destruction.

The Renaissance brought glimmers of hope to the minds of men. They still believed in the prevailing thought; but with the new appreciation of literature, the new discoveries of science, and the exploration of new continents, men's minds were greatly widened, and man began to believe in himself and in his powers of achievement. And for the next three hundred years, we find men struggling to escape the bonds of the past and to look forward to a better day; and during the latter part of this period, men began to speak casually of the possibility that man might perhaps better his condition. One of the first of these men was Brodin, a French historian, who taught that there had been some progress in the past, at least that there had been a gradual increase of knowledge, though he did not commit himself in regard to future possibilities. Another, who went a step farther, was Francis Bacon. He had nothing to say about social or political progress; but he taught that if men only pursued the right methods and avoided the errors of the past, his knowledge might be expanded indefinitely, and his rule over nature indefinitely increased. Here was the first open announcement of the possibil-

ity of indefinite progress, at least in man's knowledge of nature.

Then came the great French writer, Fontenelle, who went still farther, holding that an educated mind is composed of all the minds of the past, and that, therefore, progress is absolutely certain. All that the past knew we know, plus the added knowledge that our experience has brought us. His idea of progress, however, still lay in the realm of human knowledge. He says nothing about progress in human happiness or in morals or even in institutions. It remained for the Abbe St. Pierre to give expression first to the idea that progress lies toward social perfection. He asked, what is the use of this increase of knowledge apart from its influence upon life; and insisted that if our increase of knowledge were applied to the purpose of improving life, then progress would move toward a goal of social perfection.

It is not, however, until the eighteenth century that we find the idea of progress in full swing—an idea that dominated man's thinking for the next two hundred years. Men have now taken hold of the doctrine of "human perfectibility." Human nature is now the raw material out of which a perfect human being can be made. Human nature is essentially good. The trouble with the world is that this natural goodness has been perverted and restricted by our social and political institutions. Do away with all these man-made restrictions, leave man free, and he will always do the right thing. Out of this grew

the doctrine of human equality and the kind of political and social institutions which these men felt would foster this freedom. It was such teachings, of which Rousseau was the chief exponent, that led eventually to the French Revolution. Even though this dark and bloody period disillusioned many, there were those whose faith and hope could not be quenched. Especially was this true of Condorcet, who in the very shadow of the guillotine, wrote his great work on "Human Progress," which he felt had only been delayed by the events that followed the revolution, and believed that man would eventually stand perfect in a perfect society.

It was during the next century, the nineteenth, that men attempted to formulate the law of progress. No one now doubted the fact of progress; all that remained was to formulate the law, and Immanuel Kant said that some day would appear another Newton who would deduce from the facts disclosed by history the law upon which human progress depends. This was the task of the philosophers of the nineteenth century. One of the first to formulate such a law was Hegel who states it in his famous Triadic stages. He discovers what he calls a thesis. As time goes on, opposition develops and this breaks up into what he calls the antithesis, and at last the antithesis is resolved into a higher synthesis. This in turn becomes a new thesis which is followed again by the same process; and human progress is the result of this process. St. Simon then came forward with the Pendulum theory. Epochs of

organization and construction and epochs of criticism and revolution succeed each other, and as a result of this constant succession, mankind gradually climbs upward. Then came August Comte with his well known law of the three stages, which was given forth as the law of progress. He divided human history into three periods—the theological, the metaphysical and the scientific. In the first, man invents ideas; in the second, he deals with abstract ideas; in the third, he surrenders himself to the positive facts of science. And it was upon man's development through these three stages that Comte founded his science of sociology and his religion of humanity. And then came Karl Marx with his law of Economic Determinism; and others which I have not time to enumerate.

The real climax of this period was reached when Darwin published his "Origin of Species." At last, we were told, man found the real law of progress in the theory of evolution. Herbert Spencer spent his whole life in the elaboration of this law in his Synthetic Philosophy. He applied it to every field of human thought and endeavor; in fact, to the whole universe, making the law of evolution a vast cosmic principle to which all things had to conform. Spencer taught that progress was made by the adaptation of an organism to its environment, that all the troubles in the world were the result of lack of adaptation of things to their environment. Through the process of natural selection, these non-adaptations were eliminated. Progress has been due to the

slow but sure adjustment of all things to their environment; and, said Spencer, this process will continue until eventually a perfect society will appear and man will stand perfect on the earth. One of his strongest arguments was that acquired traits were transmitted by parents to children, so that each new generation begins where the last one left off. To him, progress was not an accident; it was a cosmic principle which could not be thwarted regardless of what man did or did not do. It was as sure as the old time conception of providence. And this idea was put into poetry about the same time by Tennyson, who sang of the "one increasing purpose" which ran "through all the ages," and of a "far-off divine event, toward which the whole creation moves."

But Spencer had scarcely passed away when scientists in the field of biology began to point out that side by side with an evolution that meant progress, there was a devolution that meant degeneration. Modern psychologists then began to teach that Spencer's view regarding the acquired traits being transmitted from one generation to another was not founded upon the facts, but that each generation had to achieve for itself what the others had achieved. And at last, scholars began to teach that evolution is not synonymous with progress, but only a name describing a process of change, and whether that change involves progress or not depends upon other factors. And it became clear that when evolution was applied to human life and social institutions, it did not necessarily mean that some

cosmic principle was pushing forward to a particular goal.

And then in the beginning of the twentieth century, men began to look back over the last century and feel as Alfred Russell Wallace expressed it in his last book, "Social Environment and Moral Progress"—the gist of which is that there is no question about the immense advance made in the arts and sciences, especially in the realm of technical knowledge; there is no question about the advance made in the field of inventions or in the contributions to the comforts of life; but in the existence of misery, of injustice, of human exploitation, of deadening competition, of preparation for war, Mr. Wallace tells us we have not progressed. And yet the general optimism of the first decade of this century was quite universal. Of course, the chief emphasis was laid upon the mechanical improvements, but the majority of people really believed in an actual intellectual and moral progress in the life of men and of nations. And people were looking forward at least in a theoretical way to the unity of mankind and believed that the world was almost ready to join hands in the realization of human brotherhood, and that the future of mankind would be happy and peaceful and bright.

Then came the war with all its tragic events and men seemed to be trust back into barbarism. The whole world spent nearly five years in a stupendous attempt to destroy almost everything that had been gained in centuries. The ideal of human brotherhood was thrust back beyond the

days of savagery. And the disillusionment begun by the war was made complete by what transpired after the signing of the armistice, when the spirit of hate and revenge wrote itself into a document which was to control international relationships for at least a generation, if not for a century. And as a result of this whole affair, we have slipped back a number of generations and are living in a period of darkness and chaos worse perhaps than any since the fall of the Roman Empire, surely the worst since the Renaissance. And so men began to write books and say that progress after all is a delusion, and the hope to improve mankind is simple fol-de-rol.

This in brief has been the history of this idea of progress; and there is one thing at least we can conclude from it and that is that there is no law of progress, or if there is it lies so deeply imbedded in the complex and conflicting currents of human history that no human mind has yet discovered it. Hegel's Triadic stages, Simon's Alternating Epochs, Comte's law of the Three Stages, Marx's law of Economic Determinism, and Spencer's interpretation of the law of evolution were interesting and ingenious attempts to base a generalization on insufficient data. No one of them, or all of them taken together, has revealed the law of progress. The discovery of that law, if there be one, lies in the future. Personally, I do not think there is one.

II

Perhaps the most significant thing about all this discussion of progress in the past is the fact that no one has ever really defined what the word is supposed to mean. And it is very difficult to discuss the existence of anything until we have defined it. What do we mean by progress? Do we mean an increase in mechanical inventions and personal comforts? Do we mean an expansion of knowledge and intellectual attainments? Do we mean an improved social and political order? Do we mean an increase of happiness? Do we mean higher moral standards and living in conformity with them? What do we mean by progress? Some one has defined it as an approach toward our ideals. In a sense that is true. The word must mean a realization of the highest and best that man can think. But this makes progress a very relative, if not a contradictory thing; and is responsible to a large extent for all the confusion that clusters about this discussion, because it makes progress as different and contradictory as are the ideals of men. And one need not reflect long upon the dispute to perceive that the disputants are heavily biased. Here is a man who has some particular ideal, which has been discarded or ignored—it may be political, economic, religious or ethical—and he is bound to think that the result is decay or demoralization; or if his particular ideal is being more or less established in the life of man, he is sure to think that the world is improving or progressing.

For instance the Christian thinks of progress in terms of conversion to the principles of the Christian church and measures advance by the number of people who "confess Christ" and become members of the church; but the rationalist thinks of this as deterioration and feels that the world is making progress only as it outgrows the dogmas and superstition, and overthrows the domination of the church. The Christian moralist thinks of progress in the light of the development of the "other-regarding" virtues, such as kindliness and mercy and self-sacrifice, and to the extent that these dominate the lives of men, he would say we are making progress; but the Nietschean would call this degeneration and thinks of progress in terms of the development of the "will to power" and the "superman." Some believe that all the life-saving and life-protecting devices and methods in addition to those things that make life easy and comfortable are a sure sign of progress; while others tell us that these things are merely pampering and enfeebling us physically and mentally and morally, and that if we would retain our virility it is necessary to renew the hard conditions of former generations. The opponents of democracy are confident that the enfranchisement of the masses has led to decay; and their extreme antagonists are equally certain that the retention of some part of the older regime is ruining us. The socialist sees no signs of progress so long as capitalism holds sway, and thinks of it in terms of a gradual approach toward a socialistic state, while the capitalist

looks upon the rise of socialism as a sign of impending doom. The militarist sees racial disaster in the growth of pacifism; and the pacifist sees it in the lingering of militarism. The critic of birth control swears that our empty cradles mean calamity; and the eugenist sees the calamity in the overcrowded cradles of the poor. The Puritan looks upon the statistics of the divorce court as a sure sign of moral degradation; while others see in this the transition toward a higher and better basis of sex relationship. The conservative views the emancipation and apparent lax morality of our youth with unusual apprehension, while the liberal sees in this the hope of the future. Dozens of mystic cults say that our materialism is dragging us towards the abyss; and the scientist retorts that these new superstitions are one of the chief historical symptoms of decay.

And so Joseph McCabe tells us in his book that there are thus a thousand reasons why we must be degenerating, but instead of arguing about those reasons, it is much better to compare the actual conditions of two different periods—that is the present with whatever period is supposed to have reached the heights and from which we are declining. Almost everyone admits that the world was never better previous to a century ago than it was at that time, so he compares the years 1825 and 1925 and comes to the conclusion that the intervening period was a "century of stupendous progress." I do not believe that any one can read this book without realizing that the world is a much better place than it was a cen-

tury ago. He produces an amazing array of statistics to show the improved condition in various fields of life and endeavor. First, he shows the great progress that has been made in the production and distribution of wealth. Most people would not question the increased production of wealth, but they are likely to be sceptical as to the more general distribution of it. But bad as conditions are today, he shows that the frequently quoted phrase that the rich are richer and the poor are poorer is a strange perversion of facts.

Then he takes up the life of the workers, and without in anyway condoning the present situation, he shows that the lot of the worker a century ago was a drab and dreary, monotonous and exhausting, miserable and wretched condition as compared with his lot today. And all this is worked out on the basis of the amount of wages and cost of living in addition to the hundred and one opportunities which the worker has today for living a more truly human life. Then he takes up the manner of handling the criminal situation and shows what improvement has been made over the ghastly penalties of a hundred years ago. Then follow chapters on the social life, on education, on morals, on political and legal corruption, in all of which he clearly shows that the man who refuses to see improvement in the last hundred years is either blind or has a very distorted vision. And his book ends with a paean of hope, based on the fact that we are just entering upon a conscious phase of evolution. For millions of

years, man has been slowly driven on by the lash of circumstance, while now we know that we are but a phase in a long process of growth, and we are learning how to co-operate with it. Civilization is just beginning. We are only emerging from infancy. Pessimism is mere ignorance. "A future more splendid than any poet can imagine is as certain as tomorrow's sun." And thus does Mr. McCabe, who is perhaps one of the best informed men in the world, assure us that progress is real and bound to continue, in spite of all temporary set-backs such as we are at present experiencing.

Mr. Durant in his article on "Is Progress a Delusion?" approaches the problem from a different angle. After giving a brief resume of what people have thought progress meant in the past, he attempts to define the term in a very concrete way, based no doubt upon Spencer's definition of life as an adjustment of internal to external relations, by saying that progress is the conquest of environment by life. That is, he defines progress as increasing control of the environment—of the conditions in which man is forced to live. Put in this way, the problem of progress is greatly simplified. There is no doubt that human knowledge is constantly increasing, that knowledge is power and that the power of man over his environment grows year by year, and that the time will probably come when man will have complete control over the conditions of his life. In this respect no one can dispute the reality of progress. To look back upon and understand the harsh and dan-

gerous conditions under which savages lived as a result of their ignorance and lack of control over their environment, and to compare those conditions with those which prevail today in this respect, is to know that we have made progress. And it is in this total perspective that we must measure progress. When we look at history in the large it gives the appearance of a graph of rising and falling cultures, nations and civilizations appearing and disappearing century after century. But in all this irregular movement, Mr. Durant tells us certain great moments stand out as the peaks and essence of human history, as the stairway of the progress of mankind. Step by step, man has climbed from the savage to the scientist; and, our author says, there are ten accomplishments which form the principle stages of man's growth in control over his environment, and it is worth noting these.

First, the development of speech which made possible the communication of thought and all kinds of social relationships and organizations. Second, there was the discovery of fire which made man independent of climate and master of the dark, and gave him a thousand things to eat which were inedible before. Third, the development of agriculture which made it possible for man to live in the same place for long periods of time, giving rise to the home and the school and all the benefits of settled life. Fourth, the conquest of animals. We must not forget that there was a time when every step from hut or cave was an adventure, and it was not yet decided

whether beast or man should master the earth. Fifth, social organization. Imperfect as this may be even today, we must remember there was a time when man enjoyed no security of life or property whatever. That only belonged to him which he was able to hold by physical force and his life was threatened at every moment.

Sixth, morality — the discovery and development of those rules of social relationship which make social organization possible, as well as the refinement of many primitive impulses into things which glorify life. For instance, love, unknown to primitive man except as a hunger of the flesh, has flowered into a beautiful garden of poetry and sentiment, in which the passion of a man for a maid, though rooted in physical need, flowers into the realm of poetry. Seventh, the invention of tools, by which man has been lifted from the menial and degrading labor of former time and given leisure for the development of mind and sentiment. Eighth, the development of science which gave to man a knowledge of the processes of nature and has thus greatly increased his control over his environment. Not only has science done much for man in the past, but holds out the greatest promise for future progress. Almost every day the scientists are learning something of prime importance to the well-being of man. Ninth, education. More and more completely we pass on to the next generation the gathered wisdom of the past, so that we have a gradual accumulation of knowledge which is bound to help man improve his condition

in the future. Tenth, writing and printing. For numberless generations, men could transmit their hard-won knowledge only by word of mouth from parent to child; if one generation forgot or misunderstood, the weary ladder of knowledge had to be climbed anew. Thus writing and printing gave a new permanence to the achievements of the mind; and bound the generations together by a common heritage. And so they can bind the civilizations together. It is not necessary that civilizations should last forever; all that is necessary to progress is that each one's achievements be passed on to form part of the permanent possessions of mankind. And so Mr. Durant concludes that by these steps we have made real progress and that we need not worry about the future. "We are weary with too much war, but never was our heritage of civilization and culture so secure, and never was it half so rich."

III

Now it seems to me that this is really the way to get at this idea of progress — define exactly what we mean by it and then study the conditions of the past and see whether or not improvement has been made in this direction. I think Mr. Durant's definition of progress is all right so far as it goes, but I should like to add something to it. In fact, I have always liked the definition of progress which I once found in a book by Sigurd Ibsen, although it is rather general and difficult to get hold of. He said, "Prog-

ress is the realization of the possibilities and demands of our nature"; and I should say that we realize the possibilities and demands of our nature just to the extent that we have control over our environment and ourselves. That is what I would add to Mr. Durant's definition—control over ourselves. And of course by environment, I mean both physical and social environment. Now no one who is actually acquainted with the facts and who takes a wider survey than that within the limits of his own life time doubts for a single moment that we have made progress in all these directions; but not in the same degree. We have made much greater progress in control over our physical environment than over our social environment and ourselves. And this, I think, is largely the cause of our present distress.

No one fails to see the astounding achievements of the students of nature during the past three centuries in adding to our knowledge of the universe in which we live, and in the application of that knowledge so as to well-nigh revolutionize human affairs; but the knowledge of man, of the springs of his conduct, of his relation to his fellows, and of the regulation of human intercourse in the interests of harmony and justice, has made no similar advance. And it is this discrepancy between the advance of knowledge in the realm of natural science and that of human science that is worrying the world today. We have gained unprecedented control over the natural forces of the universe, but have not sufficiently advanced in control over ourselves and our

social environment to use this physical control to good advantage. We bring ancient and irrelevant habits of thought to bear upon this modern and unprecedented knowledge of the natural world; to a literally new world, we continue to apply the old mind and the old method of thinking with the result that we have bungled the situation very badly for the time being; and our melancholy prophets who are always looking for some calamity to predict, some doom to proclaim, immediately raise the cry that we have not made any progress.

But just because we have advanced in one line of thought more rapidly than in another, and thus disturbed the balance, is no reason to say that we have not made any progress at all; and I believe that we are on the verge of an unusual advance in the knowledge of and control over our social environment and ourselves. We are just beginning to apply the scientific method to the study of man. Heretofore all kinds of study about man either as an individual or a social being remained in the realm of metaphysics. A generation ago when I was in college psychology, political economy, ethics, sociology, aesthetics all came under the head of Mental, Moral and Social Philosophy and consisted of nothing more than speculations based upon intuitive experiences. Today all these have become sciences, and in this fact lies the great hope of the future. For science is the real savior to which we must look for redemption. Our knowledge of nature and control over our physical environment came only

when the study of natural phenomena was taken from the realm of metaphysics and subjected to the scientific method; and our knowledge of ourselves and our social environment will make the same advance as a result of the adoption of the scientific method in this realm.

And so I believe we are standing at the beginning of another "century of stupendous progress," measured by our increasing control over our social environment and ourselves as a result of a scientific study of man and his relationships. Just think of the tremendous advance that is bound to follow the unusual interest today in biology and genetics, in biochemistry and psychology; and think how this knowledge is being brought to the people in such books as "Why We Behave Like Human Beings" and "The Nature of the World and of Man" and any number that I might mention. Think of the tremendous possibilities which lie in the present interest in real scientific psychology, in the direction of control over the desires and actions of men. Three hundred years ago, Francis Bacon, standing by the cradle of modern physics, predicted a thousand marvels to be found and formed by physical research. How moderate that prediction seems in the face of tens of thousands of accomplishments. And I believe that psychology is now entering upon a like development; and no one familiar with man's past attainments would dare set a limit to the achievements that may come from our growing knowledge of man. I believe

that man, having remade his physical environment, will now turn round and remake his social environment and himself.

And this brings us at the end to the biological definition of life as the constant adjustment of an organism to its environment, making life full, rich, beautiful, desirable to the extent that the adjustment is perfected. The adjustment is perfected to the extent that we have control over ourselves and our environment, and the increasing control over our environment and ourselves we have defined as progress. And since I see great advance made in this direction in the past, I believe that we have made progress; and believing in the still greater advances to be made in the future, I believe that progress will continue. Therefore, I believe in the reality of progress; but the progress I believe in is not the result of some law of progress which operates like the iron laws of nature, regardless of the purposes and the efforts of men. I do not believe with Herbert Spencer that evolution means eternal progress toward some perfect end. The progress I believe in depends upon ourselves. As I look back over the past and survey the progress that has been made, I do not see either an omnipotent power or a cosmic principle at work; I see only the determined effort of human beings. Practically everything in the world today that has helped in man's control of his environment and of himself has been thought out and wrought out by man himself. And any progress that we hope to see

in the future must be accomplished in the same way.

We cannot any longer believe in an Almighty God outside the universe who in spite of man's ignorance and blunders will bring about the kingdom of heaven. We cannot believe in the friendly providence that men of the last generation thought would carry things on to the heights. We cannot believe in any purposeful effort directed toward a "far-off divine event, toward which the whole creation moves." We cannot even believe in any cosmic principle that is bound to see that progress is made, regardless of what man does or fails to do. Our trust in some outside power that will achieve the progress of humanity is shattered forever. That perfect order of things which for centuries men believed God was to produce for us in another world, we ourselves must produce in this world. The old view placed responsibility for progress on God or providence or some cosmic principle. I would place it where it belongs, on man himself. We can make this world what we will. If there is to be progress in the life of humanity, it will depend upon us—upon what we are and what we do. There will be some "far-off divine event, toward which the whole creation moves," only as we visualize the event and make the whole creation move in that direction.

And I believe in progress because of my faith in the powers of human nature, in its ability to do almost anything once it wakes up to a consciousness of that ability. Our failures to achieve

progress in the past have been chiefly due to the fact that we have not realized the part we ourselves must play in the scheme of things; and a new epoch of human progress will open as soon as men and women with Promethean courage set themselves resolutely to the attainment of a full knowledge of and control over both their environment and themselves, and thus gradually "realize all the possibilities and demands of their nature."

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